American Machinist
Established 1877 McGraw-Hill Publishing Company, Inc.
New York, November 6, 1930

TOLERANCES AND TOOLS

Discussion

John Gaillard
Mechanical Engineer,
American Standards Association

In Vol. 72, pages 903 and 956, D. W. Ovaitt set forth a system of tolerances on cylindrical holes used by General Motors. Since this set-up differed materially from the tentative recommendations of the A.S.A.,* a comparison of the two methods is in order. This is given in the following article which presents the principles upon which the tentative standards were premised.

Every fit is completely determined by four limits. Two of these, the low limit of the hole and the high limit of the shaft, are usually the most important ones. Their difference, the allowance, is the main characteristic of the fit, in a very large majority of cases. The allowance is the minimum permissible clearance (looseness) or the maximum permissible interference (tightness) of a fit.

In standardizing fits, it is always possible to keep one of the four limits constant. For the reason given, keeping the low limit of all holes constant—or the high limit of all shafts—is more important than keeping either of the two other limits constant. Whether the low limit of the hole, or the high limit of the shaft, will be chosen, depends on whether conditions (manufacturing, assembling, and others) make it preferable to vary the shafts to mate the holes, or conversely. We shall consider the former case exclusively, the other one being immaterial in the present discussion.

In the American standard system, all holes have the same low limit, the nominal size. Fig. 1 represents the four American standard holes with a nominal size of one inch. In General Motors' system, the high limit of all holes is constant, as shown in Fig. 2. We shall now consider both systems, first exclusively with regard to the problem of standardizing fits as such; and second, with regard to reamers and jig bushings required for producing holes.

In Fig. 1, one specific shaft will give the same allowance—and therefore an identical fit—with any of the different holes. This presents the following advantages:

1. The high limit of a shaft, required to give a specific fit with a hole, is independent of the tolerance on that hole. When the kind of fit required, and therefore the allowance, is known, the high limit of the shaft—

*Tentative American Standard B 4a-1925 on "Tolerances, allowances and gages for metal fits," set up by a technical committee sponsored by the A.S.M.E. and approved by the A.S.A. Mr. Ovaitt is a member of this committee.

its most important one—can be definitely adopted. Its low limit, and also the high limit of the hole—that is its "class"—may then still be chosen in accordance with the maximum looseness or minimum tightness permissible.

2. It may be desired to increase or reduce a hole tolerance after production has been started. An increase, if possible, will be welcomed as it lowers production cost. A reduction may appear necessary to refine the fit. Either change may be made without disturbing the character of the fit, or the interchangeability between old and new holes. This also applies to a change made in the original shaft tolerance.

3. In mass production, internal parts—here briefly called "shafts"—are frequently made by one group of producers (department, plant, or even an entirely special branch of industry) and assembled in external parts made by another group. Even if the units of the latter use different tolerances on the holes, the "shaft group" has to make only one shaft for each kind of fit. Fig. 1 shows that a single shaft gives the same loose fit with any of the four holes.

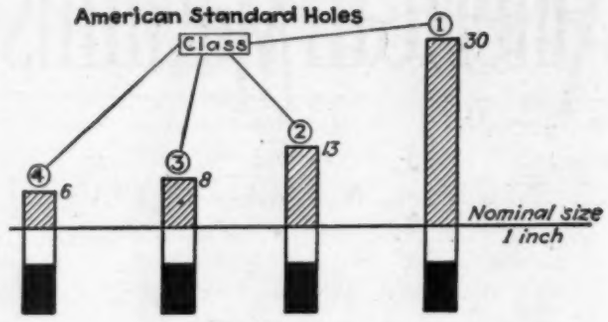


Fig. 1
(Tolerances in Tenthousandths)

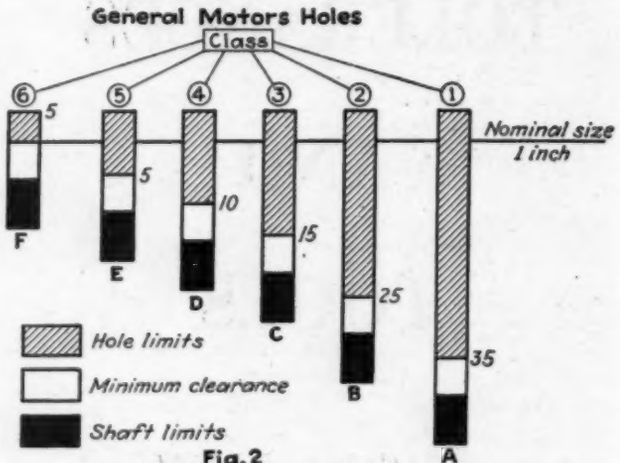


Fig. 2
(Tolerances in Tenthousandths)

THIS advantage is important in an individual concern, as it will frequently be possible to use the same shaft in combination with different holes. However, its importance becomes far greater if national industry is considered as a whole; not merely because its application is then much larger, but more particularly because one of the parties, say the shaft group, may not know beforehand with what kind of holes the shafts will ultimately be mated. This causes no difficulty, however, as the allowance of the required fit is all that it is necessary to know for producing the shaft that gives the right fit with any hole, whatever its tolerance. That is, the same shaft can be made for all users. From the above, it becomes apparent that the existence of a constant minimum size, or low limit, of the holes greatly simplifies the structure of a standard system of fits, making it more flexible and easier to handle.

For the General Motors' system, the maximum size or high limit of the hole is kept constant. In respect to the three points discussed, we find:

1. The designer cannot adopt any limit for a shaft before knowing exactly with what "class" of hole that shaft is to be mated. Therefore, the dimensioning of a shaft is completely tied up with the "class" of the hole. Fig. 2 shows that each kind of fit requires a separate shaft for each hole.

2. Changing a hole tolerance requires a corresponding change in the mating shaft in order to maintain the original character of the fit. Also, such change in principle disturbs the interchangeability between old and new parts. If, in Fig. 2, the hole is changed from Class 4 to Class 3, a shaft *D* may give too close a fit with a Class 3 hole.

3. Groups producing holes and shafts respectively, must "tune" the limits of their respective products much more carefully to each other, than in the American standard system. A supplier of shafts must know in advance not only with what kind of fit, but also with what class of hole, his shafts are going to be assembled, in order to set correctly the high shaft limit. He could not supply Class *D* shafts (Fig. 2) to a manufacturer using Class 3 holes for his own product. Each kind of fit requires as many shafts as there are classes of holes to be reckoned with.

The above comparison shows that a series of holes with a constant high limit, as adopted by General Motors, would not be suitable for a national standard system, because the latter must be applicable when producers of holes and shafts form rather independent groups, as well as where they are keeping in close contact, as in a single industrial organization.

General Motors' system concerns holes only. Mr. Ovaitt says, "No attempt has as yet been made to establish shaft diameters. We feel that this dimension is one which should be left open for the engineer to decide at the time his layout is made. Frequently experiment must be resorted to for final decision on shaft diameter, on account of kind of fit required, length of engagement, and kind of material involved."

VARIABLE though shaft requirements may be, this statement does not make clear why it would not be possible to set up a series of standard shafts, one of these to be mated in each case with a standard hole. From the viewpoint of standardization and its advantages in design and mass production, this would no doubt be a step forward as compared to leaving entire freedom to each designer in dimensioning the shafts. Standard shafts have successfully been laid down in several national standards as the indispensable complement to standard holes, and yet the combined problems of fit of all groups in an industrial country naturally present difficulties far greater than those of even a large single organization.

General Motors, focussing its attention on the problem of holes exclusively, has based its system on the principle that all new reamers are held between the same

limits, nominal size plus 0.0005 in., minus nothing. As a tooling advantage, Mr. Ovaitt claims that, "As reamers become worn down, they may be transferred from the finer class tolerance holes to the coarser class, and the maximum life of the reamer may be obtained."

As to getting the maximum life of the reamers, the principle followed by General Motors may be applied in the same way to American standard holes. To do so, it is necessary only to order all new reamers between such limits as make them cut holes close to the high limit of the coarsest hole. On the basis of General Motors' own practice, new one-inch reamers should then lie between the limits 1.0025 and 1.0022 in., the high limit of the coarsest hole being 1.0030 in., see Fig. 1. When wearing down, they may subsequently be used for Class 2, Class 3, and Class 4 holes. If not enough worn-down reamers become available to supply the needs of fine holes, the balance of the new reamers for these holes must of course have a high limit lower than that of the reamers for coarse holes. However, if American standard holes were generally used, reamers for different classes of holes would automatically become "standard," as they would be required in large quantities by industry as a whole.

Incidentally, it is interesting to note that the "standard" reamers used by General Motors, are not identical with the "standard" reamers given in the catalogs of the tool manufacturers. Unification of tools and equipment to produce standard holes is no doubt an extremely important problem, and it seems logical that in tackling it, the starting point be made the system of standard fits required, instead of the fits being established—as is being advocated in some quarters—on the basis of the present commercial sizes of reamers. It should not be forgotten that these sizes date back to a period when a national system of fits had not yet been developed.

IN General Motors' system, only one bushing is said to be required for reamers of all classes of holes. The bushing is made to the high limit of the reamer, plus 0.0003 in., minus nothing. (Table, page 957, Vol. 72.) According to General Motors' system—to judge by the limits chosen for new reamers—a reamer evidently can be used until it has worn down to 0.0005 in. below the low limit of the hole concerned. This means that a new 1-in. reamer may be used for Class 6 holes, until worn down to 0.9995 in. It is then shifted to the production of Class 5 holes, being allowed to wear down to 0.9990 in. on this job. At this moment, the minimum clearance in the bushing has become 0.0010 in., instead of zero, when the reamer was new. Thus, the fit between reamer and bushing becomes increasingly sloppy as the reamer is shifted to coarser holes. This would be avoided by standardizing, for each class of hole, a bushing with a minimum size equal to the high limit of the corresponding reamer. Of course, this would lead to diversity in bushing sizes, but this price has to be paid for getting close fits between reamer and bushing. Permitting the minimum clearance between reamer and bushing to increase to 0.001 in. or more—0.004 in. in the case of a Class 1 hole—does not seem to be consistent with keeping the inside diameter of a new bushing within 0.0002 or 0.0003 in. for the sake of accurately guiding the tool.

The following applies in general both to reamers and bushings. If tools were standardized in such a manner as to be duly co-ordinated with the American standard system of fits, this would result in their general unification—and its consequent benefits, as lower production price and ready availability from stock—without sacrificing the advantages of the basic hole system explained above. The results of such national unification would naturally exceed by far those of any effort in this direction made by single concerns, however large it may be. Time and space are lacking to deal with this larger problem here, but the writer hopes to discuss it in detail on an early occasion.

In commenting on the American standard and General Motors' system of holes, the writer does not wish to convey the impression that the former is necessarily the last word in establishing a national standard. It was set up by the technical committee concerned as a tentative standard, and now that it has been at the disposal of industry for about five years, there may be good reasons for reviewing it with the thought in mind that certain revisions may be desirable. However, so long as no departure is made from the constant minimum size of the holes, the above comments will apply, whatever other changes a possible revision of the American standard may involve.

■

Why the Metric System?—*Discussion*

E. ANDREWS
Manchester, England

THE article under the above title, on page 17, Vol. 73, of the *American Machinist*, is timely. As is fairly well known, many scientific men use the metric system. That, however, is no argument that the metric system would be equally advantageous to builders of machinery or to machinists and engineers in the workshop. Five-eighths or more of the world's trade is carried on by the United States and the British Empire, and that vast trade is conducted in the English measurement. Indeed, the English system of measurement is increasing every year. Although the metric system is now compulsory in several countries, the actual use of this or any other system is scarcely affected by compulsory legislation.

Although scientific men usually favor the metric system, the famous American manufacturer, Sellers, decided against it after long experience in his own shop. Most other machine builders since his day have reached the same decision. An advocate of the forcible adoption of the metric system some time ago stated that no difficulty need be anticipated in adapting many of the standard specifications to the metric system because there would be practically no inconvenience to manufacturers or users of materials. But there would undoubtedly be difficulty in connection with rolled and drawn metal sections, such as bars, rods and shafting, since, during the transition period, it would be necessary to carry stocks in both dimensions. These as well as drills and other tools would eventually have to be provided to even metric sizes.

It may be interesting to recall the fact that the reason for the choice of the meter as a unit was its absolute difference from any other measure in use, and it was hoped by that means to avoid creating international jealousy. It would very probably have been better had a measure which was almost universal—such as the fathom —been chosen.

SAW MAKING FUNDAMENTALS

An Interview with

S. HORACE DISSTON

Vice-president, Henry Disston & Sons

THE MAKING of good saws is dependent upon the correct steel, the proper treatment of these steels in the processes of manufacture, and skillful workmanship. In every good saw there are hidden qualities put there by the skill and care of the men who made it.

When saws were first made in this country in 1840, English steel was used, and notwithstanding the fact that the saws were expertly made and appeared superior to the imported ones, people bought the less finished looking foreign ones, claiming that they cut better. The founder of this firm could see no good reason for this, as he purchased his steel from the same firm that made the saws in England, but as this condition continued he became convinced that the English saws were really better, not because of superior workmanship, but because they knew best how to treat their own steel.

The obvious answer was that he must likewise make his own steel, and to compete successfully he must make a steel better than the imported. He held it as fundamental that one must control the source of his raw material in order to assure maximum quality.

The result was that in 1855 crucible steel was first made in this country. Every piece of iron and steel used for melting was hand-picked. The increased sales that followed this change of practice proved that Disston's theory was correct, and crucible steel became the synonym for quality in steel.

But as time passed it became evident that even crucible quality was only comparative. It was better than most steel made by the open hearth process, but one crucible batch varied from another in its carbon content and in its percentage of impurities. The batch being so small made it impossible to add a rectifier, and it was either "pigged" for remelting, or used, as opportunity provided.

We did the best with the means at hand, but were always on the alert for better methods. We tried larger crucibles, but they failed, naturally, because they could not support the weight of their contents.

Early in the present century, a Dr. Waldo interested the then head of this company in a furnace that melted steel electrically, and in 1906 the first batch of electric steel was poured and afterward rolled in the Disston plant. At the time this meant little; the furnace held no more than a crucible and the cost of melting was out of all proportion to crucible practice, and beside, it would have been necessary to build a power house to supply current for the number of furnaces we would need, so it was abandoned.

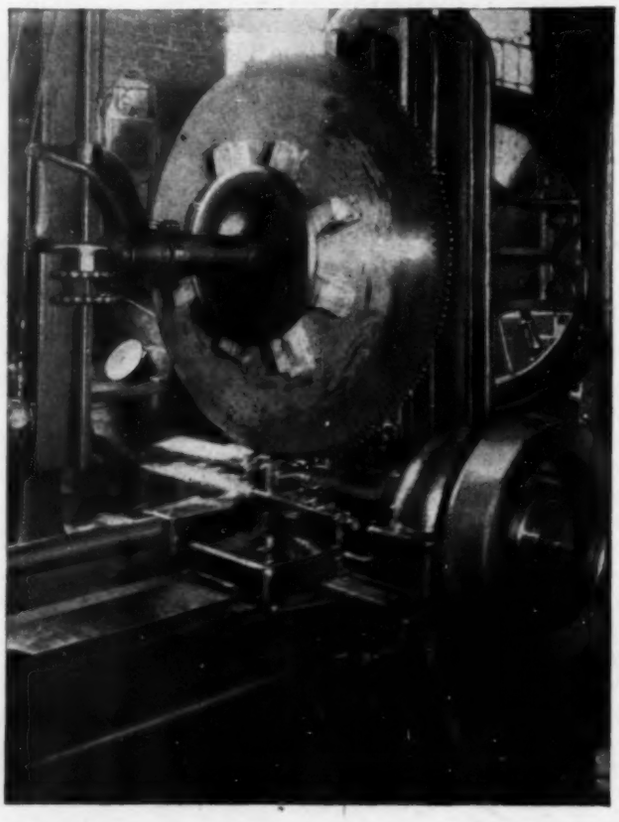
However, we watched the progress of electric melting more intelligently, and with keener anticipation than those who did not know its possibilities, and when it became really commercial, we promptly installed two furnaces and discarded our crucibles.

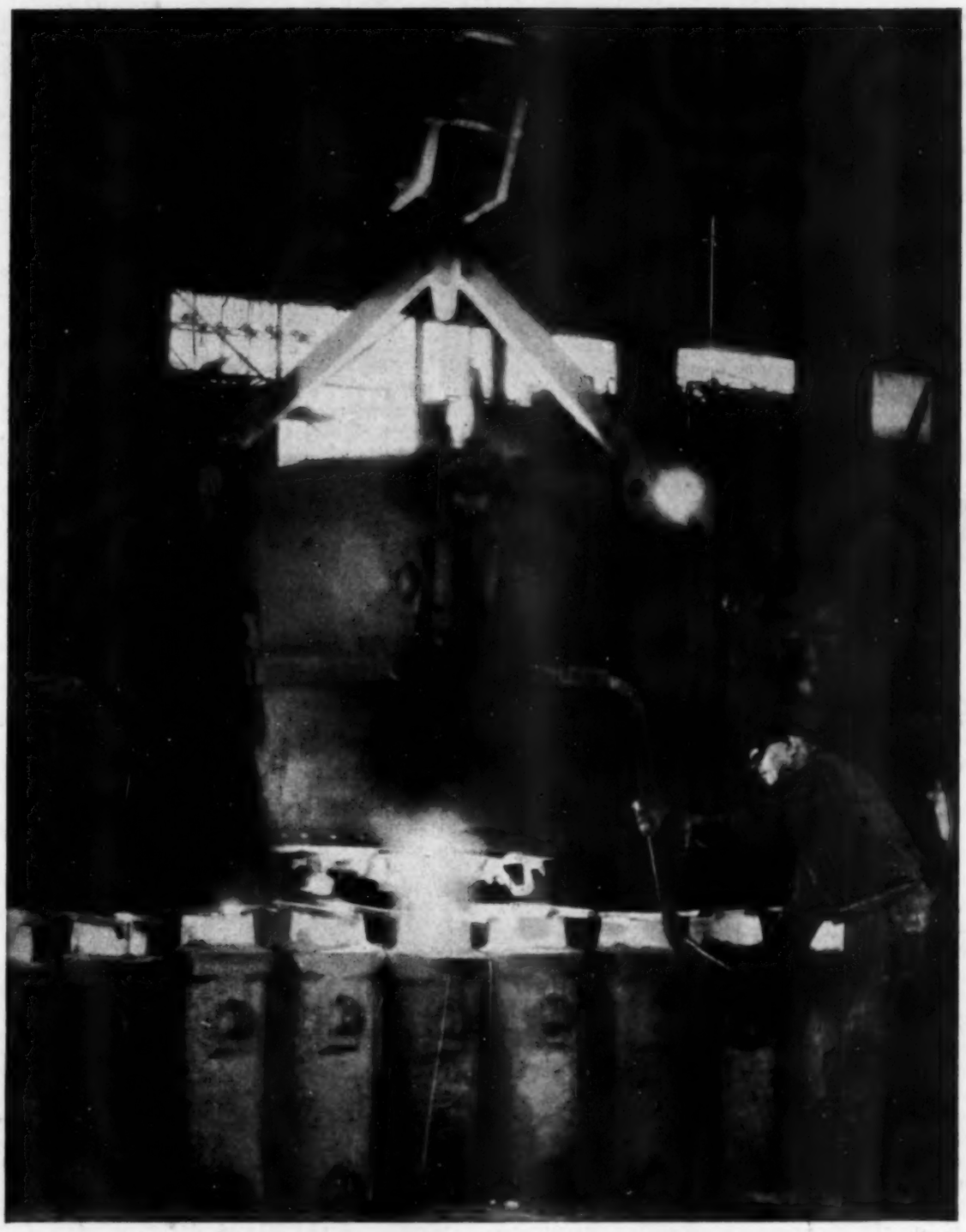
It is a matter of opinion whether the best electric furnace practice exceeds the best crucible practice. We think not, but there is no disputing the fact that the average quality of steel from the electric furnace is much higher than the average from the crucible. We did not discard our crucibles because the electric furnace made better steel, but because it made steel that was uniformly better. The ingredients used in crucible steel are a very porous Swedish pig, a good quality of muck bar, or wrought iron, and a good steel scrap of a known analysis. The same materials are used in our electric furnaces, and all the advantages of crucible practice are retained.

Fortunately, with our own rolling mill, we are able to recover croppings and scrap, so that we can say that the sources of supply for our steel scrap are under our control. No shipment of either pig iron or muck bar is unloaded until it has been analyzed and approved.

In a business such as ours we consider that the two

The teeth of large saws are milled. Note the flywheel on the cutter arbor





QUALITY BEGINS WITH THE RAW MATERIAL

most important factors in maintaining quality are: control of the raw materials that go into the steel, and the amount of hand work done on our product. It is possible to purchase two saws from the same batch of steel and that have been put through the same machine operations. One of the saws will sell for about half the price of the other. Why? Because the quality of hand work was put into one and not into the other.

Visitors to our plant sometimes remark upon the amount of hand work done, and upon the apparently crude methods still in use. Yet we built the first automatic machines for toothing saws. These machines cut 1,500 teeth a minute. Can a punch press ever equal that?

We were the first to harden saws under specially designed dies to keep them flat, the first to use automatic filing machines and automatic hammers for "smithing" saws, and yet we have been careful not to disturb the excellence of a product which depends upon the hand work done by skilled employees, for while precision can be transferred to a machine, judgment cannot.

Another important adjunct of saw quality is the laboratory, which visualizes the steel making and manufacturing operations.

During the melting of each electric furnace heat, pre-

liminary samples are taken and analyzed to insure that the final analysis will meet the desired specifications. A final ladle test is taken as the heat is poured and a complete analysis is made in the laboratory to determine its chemical and physical qualities.

Further than this we find it necessary to maintain a heat-treating laboratory where every variety of steel, and every different article made from the same steel, is studied and experimented with until the best hardness and temper for its particular use is found. This formula is then used as a specification.

THERE always has been mystery and secrecy about steel processes. The first discoverers guarded the secret of its making carefully; in the early days of saw making, the sharpening of saws was done in a locked room. Later, in our own time, when a blacksmith was called upon to make a weld, he would, at a certain point in the operation, take a little bottle from his vest pocket and sprinkle a few grains of its contents over the heating steel, and return the bottle carefully to its place. If he lost the bottle he could not, or would not, make a weld. The same secrecy of procedure was true of the man who tempered tools. He was supposed to be able to see something in a heated piece of steel which was not visible to the rest of us, and that could not be taught us. As is usually the case, there was something behind this "hocus pocus" but even those who did the work could not explain what it was. They did not realize that a slight variation made a big difference and that, in their ability to perceive that difference, they had an advantage over the rest of us. Even today steel is mysterious, and in spite of our laboratories we do things the reason for which is not as clear as are the results obtained by doing it.

Saws for cutting wood were the first products of American saw manufacturers. They included hand saws, cross-cut saws for felling and cutting timber in the woods, circular saws for lumber mills, etc. Band saws for cutting wood followed about the year 1876, and soon afterward began the rapid development of saws for cutting metal, including circular saws, first solid and then with inserted teeth, band saws, and hack saws. The date of the first metal-cutting saw is not known, but we believe that the first power hack saw blade was made in this plant. Incidentally the making of a hacksaw blade is not easy. In the first place it is hard to roll a high-carbon or high-speed steel as thin as a hack saw blade needs to be. Its surface is not finished in any way. It must be rolled smooth and true to gage. The teeth must be milled, not punched, and setting fine teeth is not a simple matter. The blades must be uniformly tempered, on the cutting teeth as well as at different parts of the same blade. To make sure of this, uniformity is tested on the Rockwell tester at two different points. It will be seen, therefore, that each hack saw blade receives individual attention. The same care is applied to saws of other types each of which is tested after hardening and again after tempering. Here, for instance, is a large, circular, wood saw just from test. Its hardness range is, say, 44 to 46 Rockwell. It is uniform throughout, and if used properly it will stand up a long time without grinding, as there are no soft teeth. Usually only one or two soft teeth get dull, and this makes the life of the saw that of its softest tooth, whereas the life of a uniformly tempered saw is that of its best tooth.

Every manufacturer, no matter what his product, is inclined to think that the difficulties peculiar to his business are greater than those of any other business. Be that as it may, it will be conceded that hardening and tempering circular saws 110 in. in diameter, and band saws 18 in. wide and 65 ft. long, is a real man's job. They must be perfectly flat, and the temper must be uniform. Metal-cutting saws, 110 in. in diameter, the largest metal-cutting saws ever made, have been operating successfully for months in a Philadelphia steel plant. Because of their size, these saws could not be hardened or tempered in the usual manner, and it is in such cases as this that the experience of skilled mechanics counts.

Our standard sizes of circular saws are hardened by a process that keeps them flat during the operation, and are tempered between hot pressure dies that retain the flatness. The improvement in the methods used for hardening and tempering has resulted in decreasing the "smithing" severalfold. Of course, subsequent grinding, blanking, and machining operations partially release the tensions set up by the heat treatment, and further "smithing" operations are necessary.

THE term high-speed, as applied to steel, is purely relative. High-speed steel can be operated at relatively higher speed than ordinary carbon steel, and the tungsten-carbide alloys at still higher speeds. Here, for instance, is what we call a sectional interlock metal cut-off saw with inserted teeth for cutting brass. This type of saw has been run at a rim speed of 10,000 ft. per min., practically as fast as a wood saw is run. It will cut a 3-in. round bar in 3 seconds. It is a standard cut-off saw, not an attrition saw. It will be seen, therefore, that the possibilities of cutting with steel at high speeds are far from being exhausted. The introduction of tungsten-carbide will stimulate research into higher speeds for steel.

Ours is a business that does not seem to have much room for sentiment, but we have here a collection of nearly one hundred hand saws that have been used over 50 years. Some of them were willed to us, some were sent by men who wrote that the time had come when they must close their tool chests for good, and they could not bear the thought that others might use their saws. Others have been presented to us by their owners as an appreciation for the long service the saws have given them.

Band saws 18 in. wide and 65 ft. long are frequently called for. They cannot be tempered or smithed in the usual way

CHECKING JOB SET-UPS

R. A. JOHNSON

BRIGHT and early every Monday morning, inspectors in one large job shop meet as a group for carefully planned instruction in inspection procedure, standards of quality, trade customs, and like topics. In this plant, care is taken to be sure that best procedure, once developed and set down, does not merely become part of the archives of the business.

Like all others, this business is different. It really is peculiar in that a great many details may be involved in the necessary specifications for its iron and steel wire and its wire products. I do not mean to infer that there is a great mass of detail in every job, but in the aggregate, there are enough details to warrant a rigid system for their control. Observance of the system is important enough to require accepted standard practices, further, procedure control is sufficiently important to justify standard instructions.

Each man attending the weekly instructional meeting has a folder containing not only his own, but all related, instructions. Thus, each man knows his own job and is familiar enough with those of draftsmen and associated inspectors to know what to expect in the line of job information, as well as to be able to substitute on other inspection jobs as occasion may demand. A carefully detailed organization chart keeps men from interfering with each other in the performance of duties. Taking a tip from the educational institutions, constant review, thorough quizzing, and the discussion of actual cases keeps instructions fresh in mind and up to date. In this way is also avoided the following of instructions simply because they are instructions, without regard to who prepared them or the circumstances under which they were formulated.

The process inspector has the triple responsibility of promoting economical manufacture by preventing further work on defective parts, of eliminating excessive spoilage, and of protecting the customer's interests as to quality. He insures that only best raw materials are used and that work is started right. As it becomes increasingly important to supply customers on short notice, the importance of starting jobs correctly also increases. It is vital that process inspectors understand their products thoroughly, be familiar with the machines that produce them, and retain the good will of the foreman and operators with whom they come in contact.

We find that the process inspector's success in fulfilling his responsibilities, while keeping the operators' good will, depends largely upon his ability to dispatch the checking of various jobs brought to his attention. Skeleton standard instructions, as presented in the accompanying table, have been drawn up to aid him.

In order to discharge his responsibilities completely in a minimum of time, the inspector must proceed according to a definite inclusive plan. He must first study his requirements or specifications. He must assemble all elements of any set of specifications ordinarily furnished to the shop and must check them. He must concentrate only on important points, although to avoid further work on defective parts he must inspect according to the sequence of operations.

Comparison, the second phase of the job, is outlined by the four key words, Material, Type, Dimensions, and Finish. Knowing the customer's requirements, he checks the material. If it is not correct, no work is started. Consideration of general conformance to type and implied trade standards precedes his going into detail. When detail dimensions are checked, he turns his attention to the finish required. When the job is complete he makes his report. It is only by following some schedule similar to this one that expeditious checking may be done. With detail changes to suit any particular business, the outline here reproduced can be adopted profitably by many plants.

Standard Instructions for Checking Set-Ups

1. Assemble, check, and evaluate all component parts for the manufacturing specifications for the job.
   - a. Read order and all change notices and notes.
   - b. Examine blueprint.
   - c. Examine customer's sample, if any.
   - d. Look over working parts or test jigs, if any.
   - e. Examine approved samples, if any.
   - f. Examine samples from past production when available.
   - g. See that gages are used.
   - h. Read over notes on previous orders if necessary to clarify doubtful points.
   - i. Trace out any discrepancies with engineering department.
2. Compare parts with specifications.
   - a. Material—check for kind, size, shape, finish and temper.
   - b. Type—Examine parts for quality of type.
     1. Note functional requirements.
     2. Note symmetry and forming.
     3. Check with mill standards when necessary.
   - c. Dimensions—Check.
     1. See that size is near enough to normal so that machine will have sufficient running variation.
     2. See that starting size allows greatest possible tool wear.
   - d. Finish—Examine.
     1. See if tool marks are disfiguring, or if they will be so after a short run.
     2. See that finish meets the commercial requirements of the job.
     3. Compare with standard samples, if necessary.
   - e. Check with previous and subsequent operations, if any.
3. Notify foreman to make necessary changes or to proceed with production if O.K.
4. Make out specification change blanks to be approved by chief inspector and send to engineering department if any corrections or additions are necessary.

EXECUTIVE FORUM

On With the New?

BESIDES being president of the King Machinery Company, John Edwards was an ardent follower of sports. Athletics of all kinds interested him, but football was his particular hobby. On a brisk autumn afternoon, he sat with his friend, Bill Holland, watching his old university fight it out on the gridiron.

"Some of these football tactics would be mighty convenient in business," said Edwards between the halves. "When a man isn't hitting the line hard enough, out he comes and a substitute goes in. Then in the second half the first player may get a chance to come back again. Men are not shifted about so easily in industry."

"Perhaps it's just as well," said Bill. "Many men would be sent to the showers before they got their second wind—and there's no second half."

"I've a problem at the shop now," said Edwards. "My superintendent, Stan Collins, is retiring on the first. He's a fine man, but he's beginning to slow up and has the good sense to step out of his own accord. But I don't know who will replace him."

"Haven't you a man in your shop who can qualify as superintendent?" asked Bill.

"It depends on what you mean by 'qualify'," said Edwards. "I can put Sam Turnbull, my toolroom foreman, in the job and everything will run smoothly. But things run smoothly in a rut, if you don't try to climb out."

"If you have a dependable man, give him the job. Promotion from the ranks is a wise policy. It keeps up the morale and wins the confidence of the entire force."

"But an opportunity to add a new player to the team doesn't come up every day—and I think a new player is needed. Collins is a man of the old school, and Turnbull has been brought up under him. If I make him superintendent, he will fill Collins' shoes—and keep the same step. I feel the plant needs new blood and new ideas."

"In trying to get them, you may do a lot worse," said Bill. "Your toolroom foreman knows the shop and the men in it. He's given years of service and has earned promotion. Yet you contemplate bringing in an untried man over his head."

"There are lots of good men available today," said Edwards. "I know two or three that have the education and training that Turnbull lacks. True, they wouldn't know the product and the men, but give them a year, and they'll know all Turnbull knows and see twice as far ahead."

"I'm afraid you don't realize what a move like that means." warned Bill. "Instead of your present smooth-running organization, you'll have cross currents and petty jealousies. Friction between the old force and the new man will result, and before you're through, you may lose some good men. Harmony is a valuable asset. If Turnbull can handle the work, give him a try at it."

"It's not a question of trying, I must choose between Turnbull and a new man. If the outsider fails I can get rid of him. But Turnbull means another fifteen years or so of placid plugging."

"Don't forget that teamwork counts," said Bill as the second half commenced. "Games aren't won by substituting green players."

Topic suggested by James K. Matter, E. G. Budd Manufacturing Company

■

What Do You Think About This Problem?

Many concerns proclaim a policy of promotion from the ranks, but often forget it when an important position is to be filled. A typical instance is when a deserving employee is available who can qualify passably well but who lacks the initiative to develop progressive ideas. Which is better—to reward the old employee with advancement or to hazard the introduction of a new man? Send your views on this subject to *American Machinist*.

. . . Discussion
of Executive Problems

■

The More the Brainier?

The press supervisor should be entirely in charge, that is, he should have the final "yes" or "no" to all suggestions offered. However, the quickest method of getting to the bottom of a complicated problem is for the supervisor to call the toolroom foreman, pressroom foreman, the chief die designer, the head of the division, and the production manager to witness the die in action. The supervisor will receive many suggestions, which he will write down together with all objections. The suggestions and objections are typed, and copies given to all interested. Each man studies his copy and reports his decisions to the press supervisor, who decides what should be done. He gives his directions to the chief die designer, who has the necessary drawings and changes made.

The die is then altered as redesigned. The group, that first witnessed the die in action, is again called to see it after the changes have been made. This method saves many dollars which would be wasted by using the "cut and try" system.

—GEORGE HOOGERHYDE, *Chief Die Designer, American Seating Company.*

Concentration or Confabulation?

To restrict the foremen's calls to a certain hour may be justified to a certain extent, but it cannot be applied to all calls. For example: a foreman wants to see the works manager concerning a job which demands immediate action. To wait till two o'clock the following day may mean the loss of several hundred dollars. It is obvious that there must be an expedient.

Furthermore, the psychological effect upon a foreman's mind may be a dangerous one. He is likely to wait for an opportunity which enables him to show the works manager that his policy, limiting communication between himself and the foremen, is not of much benefit to the company. This he may accomplish by waiting half a day, or perhaps a day when a delay of half an hour means considerable loss to the company. If the works manager tried to reprimand the foreman for the delay, the only answer he could expect would be, "I acted in accordance with your instructions."

Why not inform all foremen to call only in very urgent cases and that all other calls have to be made each day between two and three o'clock?

—ALFRED LOEFFLER, *U. S. Rubber Company.*

Success or Successor?

If a company is one noted for playing the straight game, one way by which the competent chief aids company and individual success, is by seeing to it that his assistants are able to make good and to accept responsibility during his absence. He recognizes that it is up to him to so arrange matters that departmental excellence shall not be let down during his enforced leaves. By playing the straight and honorable game with his company and assistants, he really plays it with himself also. The more he can get out of his department, and the keener and more competent he can induce his understudies to become, the more valuable are his own services when rightly interpreted. It takes a magnanimous and highly qualified man, however, to adopt such an attitude. The man who is distrustful of his own abilities is likely to see in the excellence of an assistant a direct menace to his own prospects. If the distrust is justified, then the fear is also justified. Such a man is not likely to last long, unless he applies the necessary corrective to himself.

A chief's success is seldom by reason of the actual amount of work he is able to perform unaided. His success is measured in terms of the work his department performs. That volume, and the quality of it, is more than anything else responsive to the stimulus he is able to impart. One most important factor is the co-ordination of the separate efforts so that all function collectively. In short, the chief's success is realized in the success of his department. Apart from that, however excellent may be his own particular contribution, he has failed in the main task appointed him.

—W. R. NEEDHAM, *Engineer, English Electric Company, Ltd., Stafford, England.*

The Urge to Merge

It is possible for a tool and die man to acquire a workable slant on the jig and fixture end of a business, but it is improbable that his viewpoint will ever have the practical value of the man who is essentially a jig and fixture specialist. Assuming that the two lines will be kept distinct, with each man at the head of his department, what would be the advantage of the merger? It cannot be the advantage of their combined experience, because they would not be combined; it cannot be reduced power, light, and rental costs because horsepower and candlepower, and floor space would not be reduced unless the output were curtailed; it cannot be reduced executive expense because the number of executives would not be decreased. The advantages of combined tool equipment is illusionary; tools cannot be used jointly in two departments without creating dissension when an attempt is made to apportion the cost of replacements.

In the event of the merger taking place, how would the authority of the executives be defined? Theoretically, using the experience and ability of the individuals as a guide, it should be upon a basis of equality; practically, this would be impossible. Unless someone is placed in supreme command, with the duties and authority of the subordinates definitely outlined, there will be an overlapping of authority, with petty jealousies finding a foothold.

One salesman soliciting orders for two lines may mean increased sales in some cases. Other sales will be lost,

not because of the inability of the salesman to discuss intelligently the merits of both products, but because of the inability of many prospective customers to associate an old company with a new line. This is because a manufacturer acquires a certain prestige in the manufacture of a product, he becomes known as a specialist in his line, and the mind of the prospect becomes affixed in the opinion that it is a risk to place an order for the new line. —R. H. KASPER, *Master Mechanic, Steel Heddle Manufacturing Company.*

Inspection or Discretion?

In general manufacturing establishments, the inspectors quickly become familiar with the use of the various parts which pass before them, and they should have certain discretionary powers to go beyond the limits set by the engineering department. All variations should be pointed out to the department concerned so that the inspectors do not form the habit of "chancing it."

If it is possible to manufacture to the limits fixed, the passing of certain parts outside these sizes should not entail an alteration in the standards. Every increase in limits grants the shop powers to use less accurate equipment, and departure from even the larger limits will be sought sooner or later to save scrapping large batches of work. In this case, the discretion will probably be exercised by a high official.

No one can afford to adhere rigidly to limits when small powers of discretion awarded to an intelligent inspector would enable work of a reasonable accuracy to be passed.—ROY VERNON WADE, *Glasgow, Scotland.*

Is Interest Important?

I am strongly inclined to concur with the accountant's viewpoint in insisting that exact cost figures are absolutely necessary. Undoubtedly, competition is the chief factor determining the market price of a given commodity; but it is equally true that the competitive selling price will tend to stabilize toward the cost of production plus a certain margin of profit.

It is a most unjudicious business policy to compete nowadays blindly and let the other fellow set the price. It is difficult to see how excessive costs of production and uneconomical manufacturing methods can be detected and checked without accurate cost data.

Whether or not to include interest on investment in the cost of a product seems to depend upon one's interpretation of profit and cost rather than upon accounting theory. This perhaps accounts for the widely divergent practices. —GEORGE BELBES, *Teletype Corporation.*

The Other Fellow's Toes

A concern must always be on the lookout to add to its present lines. As times passes, our old reliable concerns see their staple products either replaced or entirely obsoleted due to radical changes or new discoveries.

In seeking new products, the concern should have reliable information on companies manufacturing the proposed additions to their line. This data on each prospective competitor should answer the following questions: Is the company a stock corporation or more or less of a family affair? Is the managing executive keen and wide awake to the possibilities in his line? Has he developed the financing, manufacturing, and marketing divisions as well as they should be? Which size or part of his line does he try hardest to sell? Is this size or part of the line where he makes the largest profit?

With a proper survey of prospective competitors and the probable demand for the product, together with the avenues of outlet, the president or the board can soon make an intelligent decision on their concern's course.

Theoretical economics and the effect on the industry in general are not to be considered, if the concern has men of wisdom with backbone to carry through. Good stiff competition, especially from an outsider, does more to awaken languishing concerns than all the good resolutions, pep-meetings, and sales conventions could dream of doing. This type of competition not only brings about a substantial reduction in manufacturing and sales costs, but also effects wonderful improvements in the quality of the product.

—E. E. GAGNON, *Mechanical Superintendent, Raybestos-Manhattan Company.*

How Much Incentive?

To talk of the percentage to be given the workman in the Halsey premium system is to talk aside of the true point, as this amount can be adjusted by raising or lowering the time allowed in proportion to the time that should be taken. The thing to be accomplished is to set the rate so the workmen will average a certain number of cents per hour in addition to their base rates for doing the job within the allowed time.

For instance: suppose we allow ten hours for the job, and studies show it should be done in eight hours. If the workman's rate is 70 cents per hour and he saves the two hours, on a 100 per cent basis he will receive $1.40 extra or 17½ cents per hour. If, we allow twelve hours and give the workmen 50 per cent of the time saved, he will save four hours divided by two giving him the same amount per hour.

The executive should decide that he wishes the average workman to receive a certain amount per hour, say fifteen cents in addition to his base rate. This means, of course, that some workmen will earn more than this, and some less. In setting rates, the data must be analyzed scientifically to show the amount of time which should be spent on the job.

Although the men's earnings may be the same by varying the time allowed, I believe the workmen feel that they are getting more, if the time allowed is set so as to give them 100 per cent of the saving; besides it simplifies cost figures.

If the average department rate is 70 cents per hour, and it is desired to set rates to give men fourteen cents per hour, premium on a 100 per cent saving basis then the time allowed will be equal to:

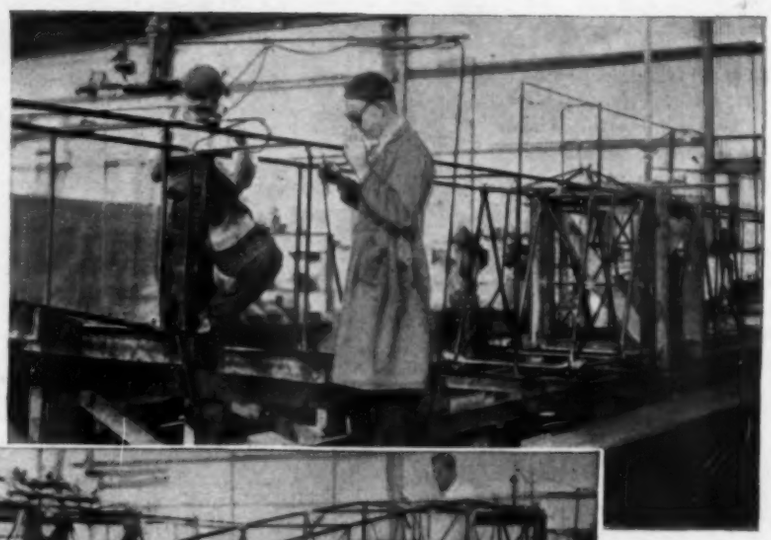
$$B + \frac{14\,B}{70} = B + \frac{B}{5}$$

Where B is the time in which the job should be done.

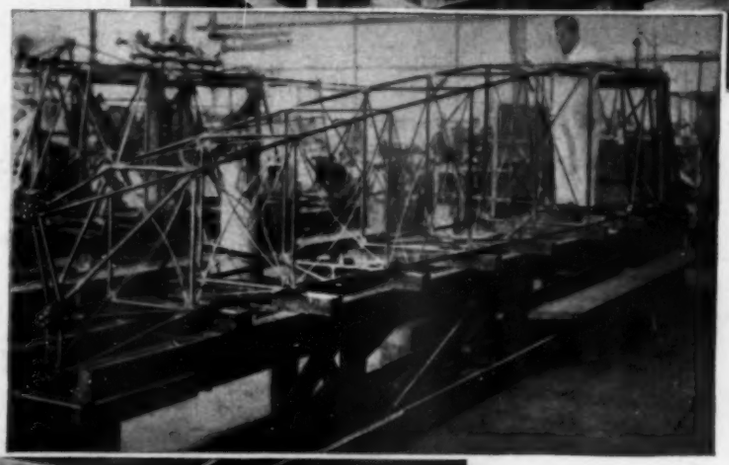
This is a much more logical approach to the Halsey premium plan than to attack the problem by discussing what proportion of the time saved is to be given the workers. If the times are properly worked out, this method will accomplish the same purpose as the more intricate incentive plans. —WILLIAM A. WALTER.

WELDING THE BODIES OF MECHANICAL BIRDS

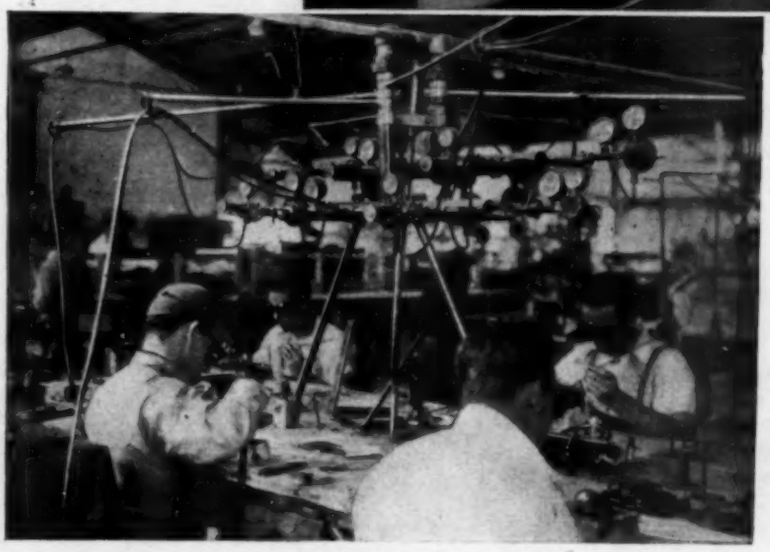
FIXTURES and methods used in building Army airplanes at the Douglas Aircraft Company, Santa Monica, Calif.



Simple clamps on the crosspieces locate tubular frame members on this double-ended welding fixture, operators using both the shop floor and the raised deck at their convenience

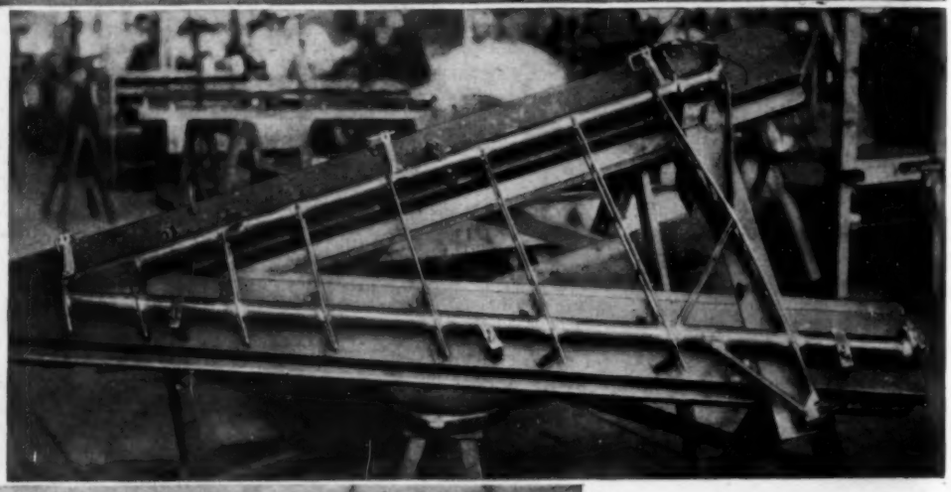


Cross-bracing wires and tail end structures are added after the part-finished fuselage has been inverted. Welded steel tubing forms most of the fuselage structure

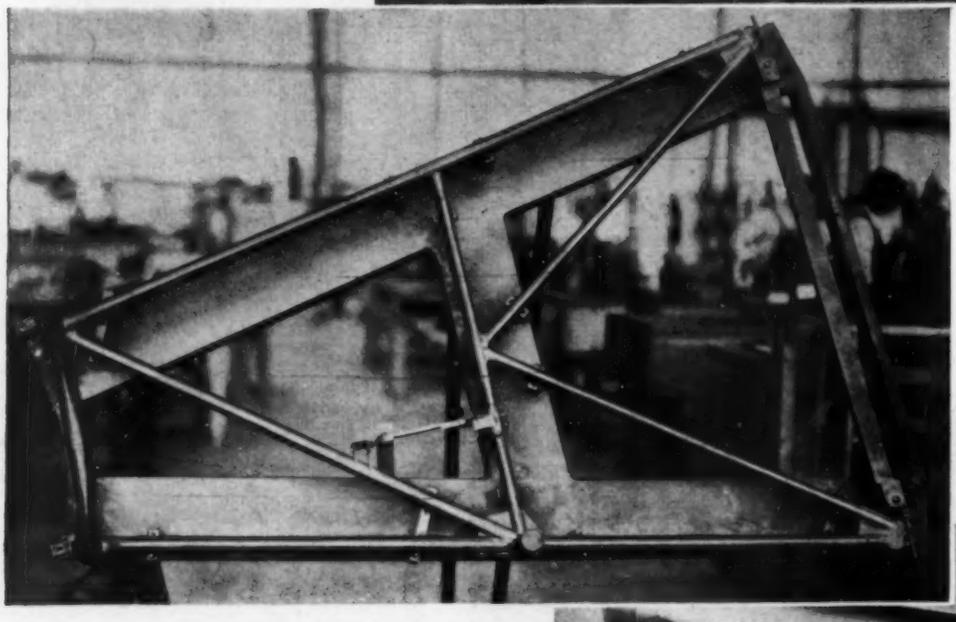


Smaller parts, such as wing ribs, tail surfaces, and fittings, are welded at six-man benches, gas being piped in. Pressure gages are mounted in readable positions, and extension arms carry the hoses out of the way behind the operators

WELDING THE BODIES OF MECHANICAL BIRDS

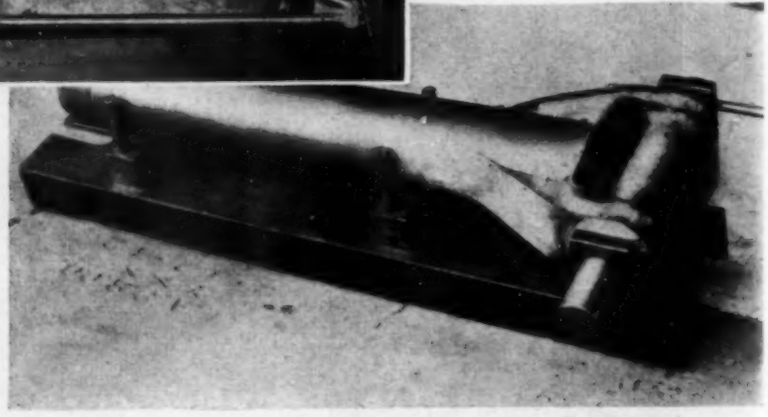


Pins and clamps locate tubes for welding a rib. The finished rib appears at the extreme right in the next illustration. Since all of the brace members lie in one plane, this fixture is not so complicated as some others

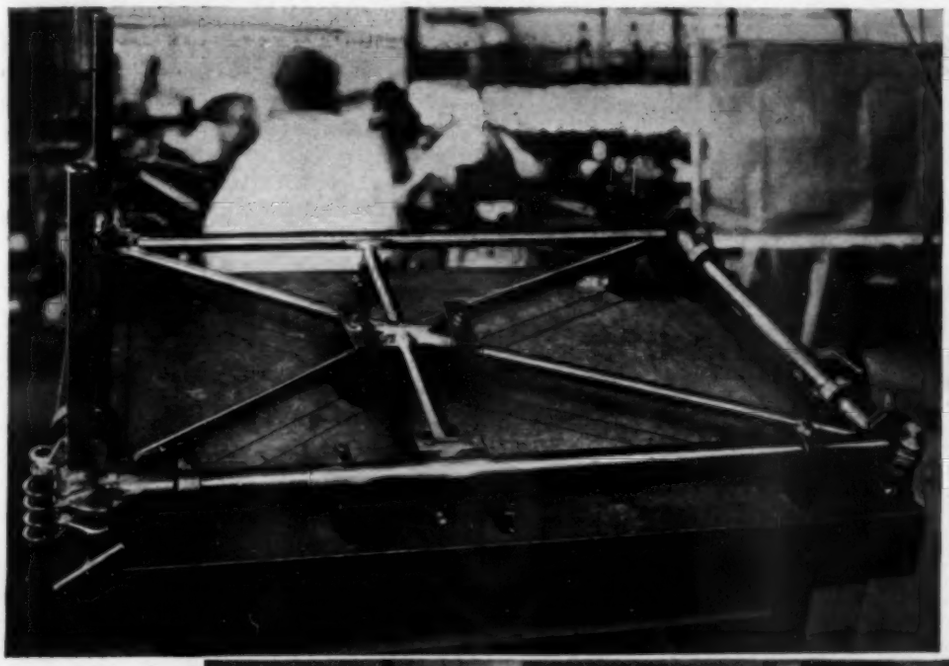


A much larger fixture, with section in place, tipped for photographing. Alignment is made certain by locating blocks and clamps

Tubular braces are here held for welding by pins in supporting blocks mounted on the fixture. A special gage locates the small ears

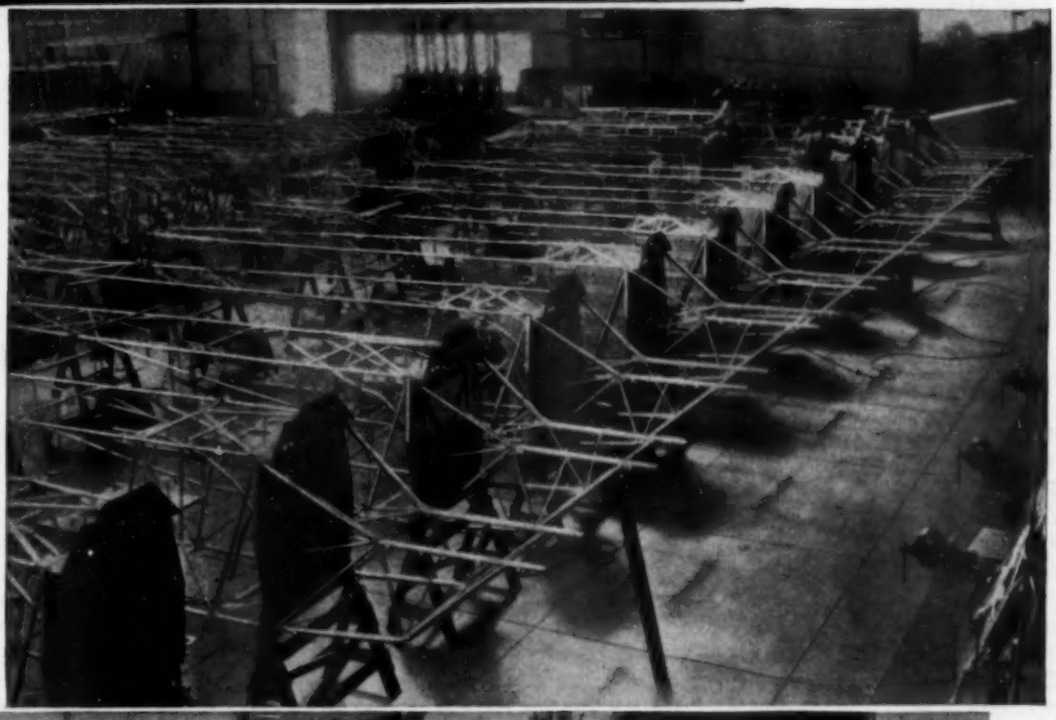


Insuring a right-angle weld on a built-up spade end by locating the tube between pins and inserting a larger pin in the sleeve. The piece is thus held securely until the joint has cooled sufficiently to prevent distortion

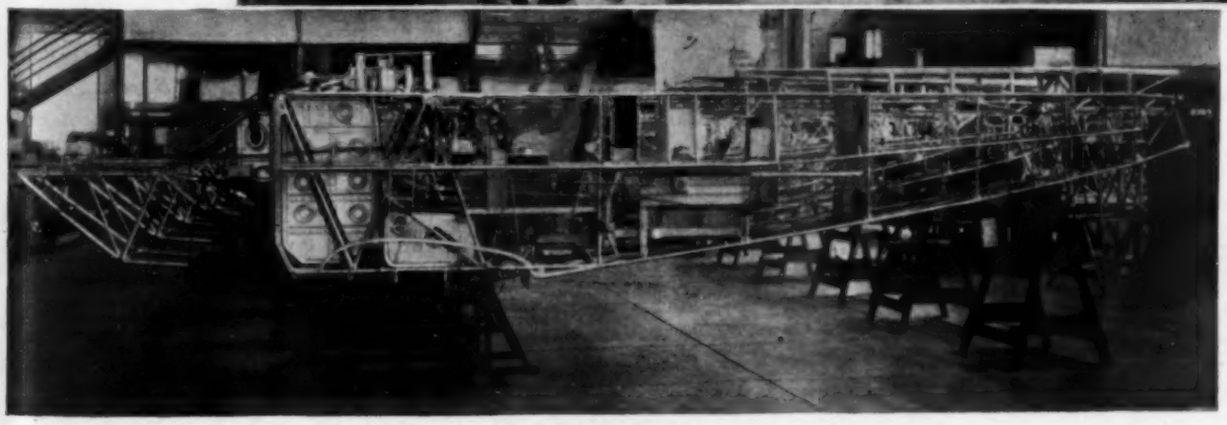


Welding a tubular bulkhead or cross-member having corner fittings. Substantial locating blocks and clamps prevent distortion or misalignment

Army planes on the assembly line. A fire wall behind the engine mount, the fuel tank, and other parts are here attached preparatory to covering. Fuselage covering and wings and control surfaces are added in the next step, and the engine and cowling mounted



Fuselage ready for covering. The number of welded parts is evident, as is the fact that space is at very much of a premium. Space considerations make it essential that joints be as compact as is possible consistent with safety



What The Accountant Expects

Last week was discussed what the executive could expect from the accountant. Here is the accountant's side of the question. Without sympathetic understanding and co-operation on the part of management, the accountant's efforts are greatly handicapped

Thomas B. Frank
Treasurer, The Cincinnati Planer Company

BUSINESS is a complex organization of many activities, from the securing of an order and its progress through the factory, to its final shipment to the customer. It is management's function to correlate and control these various activities. To this end management must have thorough and complete information which it is the function of the accountant to supply. The thoroughness and completeness of this information depends largely upon the attitude existing between management and its accountants.

The process of securing accounting information is necessarily intricate. Few businesses enterprises are so simple that adequate control may be obtained without the use of a relatively complicated system. The accountant faces a proposition that is not simple but highly technical. His road is often strewn with the remains of bad business policies, poor judgment, and injudicious decisions. His first job is to clear away the prejudices and old inefficiencies, and to steer straight for effective control.

It may not be amiss to outline briefly some of the functions necessary to the installation and operation of accounting work in a modern business organization. First a procedure must be conceived and set down in definite form. The management must give its approval and support; the co-operation of all executives must be obtained. Forms and mechanical methods must be designed and provided. Surveys must be made of the personnel of the organization to fit each clerk into the plan in his proper place, and to hire new ones if necessary. The entire staff must be trained in the proper handling of the work. Final reports must be devised and methods worked out whereby the results may be sold to the executives or department heads who are to use and benefit by such reports. The mere compilation of many figures, drawing them together from many sources and condensing them into a terse statement of fact, is a complicated piece of work in itself. However, every piece of accounting data must pass through all of these stages of development before the final statement is delivered.

The accountant, if he is to carry out the function of his office, must then expect from the management several things. First in the order of expectancy is the wholehearted backing of the manager for the accounting plan to be followed. There must be no equivocation or reservation. Management should provide working conditions that are productive of perfect work. Accounting work is very exacting, and to be efficient, the accountant must not be compelled to work in a noisy or congested office. Noise and interruption have been the cause of more errors in accounting work than any other factors.

The manager should so organize the business that definite lines of function as well as of authority may be drawn and a duplication of work eliminated. The accountant is compelled to work with every department, and unless the differentiating lines be clearly distinguished, he is handicapped before he starts. It would be useless for the accountant to try to compile figures pertaining to operations, costs, profits, and losses of all sorts without a definite plan of organization before him. Ac-

counting work follows the lines of organization. To make for a better understanding and to facilitate the handling of the business of each department, the efficient and sincere manager should see that his organization is properly set up and definite authority delegated to the several department heads. It is only then that the accountant is in a position to collect economically the accounting facts pertaining to each phase of the business.

The manager should acquaint the accountant with all of the internal and external conditions affecting the business as well as the conditions affecting the particular industry concerned. He should explain the many problems which affect production, sales, and finances. All the difficulties and perplexities encountered must be revealed, so that the accountant may place the proper weight upon these conditions when he interprets accounting figures. Many accounting reports are of no practical value because they do not tell the complete story, all because the manager has failed to explain certain conditions to the accountant. The accountant will endeavor to give management the best information he can, but he is working under limitations unless he is in possession of all information that may affect the meaning of his reports. Management can very easily make costly mistakes by overlooking these conditions. Usually the manager is not an accountant and cannot himself properly evaluate the significance of these conditions to the accounting figures. It is part of the accountant's job to handle all such matters in an intelligent manner. The accountant is trained to treat all the data he handles with the utmost confidence, and management should feel assured that such information will be protected at all times.

The manager should be familiar with accounting information so that he may make the utmost use of it. He should make every effort to familiarize himself with the various methods of presentation so that he may readily understand which accounting facts are most valuable to him. Improper utilization of accounting facts may cause an endless amount of trouble. Since accounting reports are usually drawn up in condensed form, the manager should have a complete knowledge of the component facts represented. Detailed reports should be unnecessary unless to settle some particular point at issue or to determine variations. The manager should not hesitate to seek the counsel of the accountant in any matter pertaining to the interpretation and use of his work.

THE manager should be constantly critical of the accountant in a constructive manner. Many responsibilities rest upon the shoulders of the accountant, and he must be alert to changes and improvements. The manager should take time to go over things with him periodically to reach a mutual understanding of application to the business shown by accounting figures. A great many managers have been accused, often justly, of being too busy to bother with the accountant. So long as the manager keeps up with things himself, he believes that is all that is necessary. If he would but stop to realize that the accountant is in a position to place clearer interpretations upon various subjects, the manager would have better and possibly sounder ideas of the facts upon which he is called to base his action. The financial effect on the business of making certain decisions, making changes in products, organization, or personnel, all should take on a new significance in the light of the accounting interpretation.

The ineffectiveness of many accountants and accounting departments may be attributed to a lack of morale in the organization rather than to weakness in the accountant or the department itself. Morale starts at the top of an organization and goes to the bottom. Possibly the manager has failed to grip his subordinates with his personality or to insist upon firm discipline without bluster and obtrusive aggressiveness. With proper leadership, an alert organization will result, and lack of morale will not cause inefficiency in the accounting or other departments.

THE manager should at all times endeavor to bring his entire staff into full co-operation with the accountant and with the ideas and aims of accountancy. In doing this, he should specifically emphasize that the figures are not intended as a criticism but as a help or a guide to show the management, foremen, and workers the progress of their work. It is true that many reports will show up inefficiencies and faults, but if the manager has properly handled the members of his staff all along the line, the defensive attitude usually assumed by such people will be gradually broken down. The fullest benefit may then be obtained from the use of the accounting reports.

Nothing is more destructive and discouraging to accounting initiative than an apparent inertia on the part of the manager in taking action upon facts brought out in accounting reports. There is hardly a report that does not contain information inductive of executive action. When the manager sits by and fails to take advantage of these opportunities to make savings or eliminate losses, the result is bound to be discouraging to the accountant. If the manager but show an appreciative attitude, there is practically no limit to the initiative of the progressive accountant. The beneficial results will bespeak themselves.

A great many executives are skeptical about making changes in accounting systems and often refuse to permit their accountants to take steps that would tend to simplify the work, increase its effectiveness, and result in reports that would be more useful to the manager. All too often suggestions from the accountant are not given careful consideration, simply because management is afraid that they will "add to the red tape." It should be remembered that the man who is doing the accounting work is in the best position to find places for improvement. He is just as ambitious to turn out real economical production as any other man in the organization and has no desire to increase any of the so-called red tape in the office organization. If the manager encourages such suggestions and sits in with the accountant to go over the details, the result is sure to be worth while. There is entirely too great a tendency to discourage new ideas simply because they involve changes. Progress without change is impossible.

Shop executives are usually the chief offenders in objecting to changes. It is manifestly simpler to continue the use of systems with which everyone is familiar than to memorize new forms and procedure. However, the older procedure is often not comprehensive nor productive of results that modern conditions require. Managers should encourage the idea of progress in accounting work and in the use of accounting information as they encourage progress in the development of their product. After all, accountancy is a contributing factor to the success of any business, and, as the business climbs to greater accomplishments, the accountant's work must keep pace.

The Foreman's Round Table

A FRIEND AT COURT

"HELLO, Al. What are you charging for advice this morning?"

"The honor of being called upon is sufficient pay, old top. What's on your mind?"

"My friend, Joe Black, is going to be out of a job. They posted a notice that the plant would shut down on December first for inventory and overhauling, and would re-open when the demand for their product justified it. Isn't that a nice Thanksgiving proclamation to slap a man in the face with?"

"It's sure tough. But what advice do you want? How to frame a similar notice for our plant?"

"Certainly not! I want to know what you think of my hiring Joe for an assistant?"

"What! Are you crazy? Haven't we enough trouble taking care of our men? You could never in the world get by Williams with that proposition. Don't try to."

"I don't see why not. He says himself that the time to build up a department is in slack times when good men are floating around; and I have a chance to get hold of a crackerjack man. He can't go back on his own word, can he?"

"Come to think of it, maybe not. But how about some of your own men?"

"There isn't one that can handle the job to my satisfaction. I have never believed in training someone to take my job away from me, so all my men are good workers but poor foremen. None of them would expect the job."

"And yet you would take in a crackerjack man, as you call him, as an assistant."

"Yes, but Joe is a very good friend of mine, and I could trust him to do as I wanted. The company would benefit too."

"Yes, I think everybody would, Ed, except you. But go ahead, put it up to Williams. Everyone is entitled to be a damn fool once every so often. I've had my turn, and at just that same thing, too."

"How come? You never said anything about it."

"No, I didn't. It isn't a pleasant thought, even after several years. I had my first big job, and I suppose I was a little shaky and wanted moral support, so I got a friend to quit his job and come with me as a lathe hand. The other men got next right away, and for a while it was tough going. They said I gave him all the good jobs, and when I gave him a raise, the others said that it was because he was a friend of mine. When there happened to be a vacancy as assistant, they all knew who would get it, because he was a friend of mine. The fact that he was really the best man in the shop didn't cut any ice at all with them. He was the boss's friend."

"Why didn't you make him assistant anyway; they were only jealous."

"I did. I figured that it wasn't fair to penalize a man just because he was my friend, and to be square, I had him made assistant. Then things began to happen. Costs went up, work became sloppy, and I was on the carpet about twice a week. That made me mad and indifferent. Finally I was asked to resign, and my friend Taylor was given my job. He had been working for it from the time I had him appointed assistant."

"Well, that guy wasn't a real friend. Joe Black is."

"Maybe. But a wise man, a long time ago, used to pray: 'Oh Lord, protect me from my friends. I, myself, can take care of my enemies.' "

Is Ed storing up grief for himself? Can Williams be expected to veto the proposition as against good shop management? Should a friend submit himself to such a handicap?

Suggested by G. H. Gunn, Naval Aircraft Factory

▸ ▸ ▸ Discussion of Former Topics

Who's Who in Industry

I believe Al is right in his belief that single-action trades, like pipe fitting and brick laying, are not on a par with the carpenter's and machinist's trade. I believe that, in time, industry will recognize this in a practical monetary way, but it will have to come as a result of a gradual system of evolution, rather than in radical readjustments in individual concerns.

Many of these single-action industries have attained their advantages through long established customs based on fundamentally different concepts than their present activity, through strong organization for collective bargaining, and in recognition of the seasonal nature of their employment. Natural competition itself will do a great deal to eliminate these inherited advantages, particularly the false premise that a man who only works half the working days of a year in an industry should get a gross return approximating that of a worker in a more "fortunate" industry who works every day. It is up to both employee and employer to get together to make work more steady in these seasonal industries, for if they do not, the time will come when the new competition between different industries will leave them high and dry—as witness the plight of the anthracite coal industry.

Brain power has been and always will be at a premium. Where you work, with what tools and with what materials, is becoming of decreasing significance. It's what you do, what skill you require, how much training you need, and how much you must think. Expert, mechanic, specialist, operator, and helper are far more logical classifications, regardless of industry.

—CHARLES KLYNE, *Foreman, Russell Machine Company.*

From Soup to Nuts

A foreman should attend a social gathering if he is invited to do so. As a rule, however, the chances of a foreman getting an invitation to a gathering of prominent men are very small. At least, he is not considered to have the social standing necessary in a crowd where fine breeding and much capital are represented.

If the treasurer of a company at such a meeting speaks of things in a way that the foreman cannot accept, he should be considered as being invested with reasons that the foreman does not know.

No foreman in a shop today could be so ignorant of working conditions, operations, or tools that he would not know the difference between a lathe dog and a Russian wolfhound.

If the guest of honor is troubled by his dress and cannot appear natural, it is probably because he is not used to gatherings of this kind. The foreman should also study Mr. Everett's nephew to learn how he wears his clothes. Many business men have been successful because they have been well versed in the art of appearing to advantage at social gatherings. The foreman should try to gain this knowledge.

A foreman cannot attend social gatherings to the same extent that the president of his company does, even if he has opportunity to do so, because his working hours are long and he must not jeopardize the efficiency of the shop. If he can stand the effort and expense involved in attending activities outside his factory without loss to the company he serves he should do so. I think, however, that if he gets results in the shop he may some day be the guest of honor at a gathering similar to the one in question.

—A. E. FRISTEDT, *Bolinder Works, Stockholm, Sweden.*

Do Errors Cancel Each Other?

Joe was unfortunate, and one might say a bit careless, in that he failed to check his instructions before starting the job, but it is presumed that he is a good man generally and we know that all good men make mistakes at times. I recollect seeing a drawing in the *American Machinist*, a year or two back, of the man that never made a mistake and if I remember rightly he was depicted as an old tramp lying full length and fast asleep. Mistakes come under different titles according to the department where they occur. If made in the Head's office, a slight misunderstanding has occurred. If it's made in the drafting room it is called an unfortunate error, if the foreman has made it, it is a blunder, and if the workman is the guilty man it is nothing but "blamed" carelessness. However, this particular mistake was made by Joe and the question is, who shall stand the racket?

Smith, the inspector, passed the gears as O.K. and sent them into stock. He has a certain amount of liability. I should think he ought to keep quiet and let Joe and the production manager settle it with the superintendent, who if he is a decent sort of fellow and knows that Joe is not likely to make a "bloomer" like this again, will put the loss on the shoulders best able to bear it—the company's.

—G. T. HEATON, *Engineer, Charles Baynes Limited.*

The Community Fund

We all know that the cheapest and easiest way to collect funds for a group of charities is through a central source, or community chest movement.

We may know these things, but the next thing is to impart our knowledge to the rank and file so that they can understand what it's all about.

It is a queer thing, but a fact nevertheless, that the people who stand to benefit most from the community chest are the least willing to give their financial support to the movement.

I cannot blame a foreman much if he is not enthusiastic about going out and collecting funds for these charities, because I know from experience what a job it is. However, it's got to be done.

In our experience we have found that the men in the skilled trades, earning the best pay of any group of our workers, are the hardest to get anything from. We have

always had trouble to get these men to see that it was a benefit to the community.

One of the objections to giving has been the fact that certain persons were drawing salaries for administering these funds. The men thought that the work of administration should be done gratis, but anyone, after a little reflection, can see that some one must devote considerable, even their entire time, to this work, and to ask anyone to do so without remuneration would be unfair.

In this city, every factory is solicited for funds once a year. Our solicitors are told that our share is and we canvas to get the quota. Sometimes we do not get the amount needed on the first try, so we make a second trip which generally produces the necessary amount. We never threaten nor make it a personal matter, but we do appeal strongly to the worker's sense of duty to give all he possibly can.

I believe it would be a great deal better, however, if these funds could be collected as a personal tax by the city. Everybody would then have to contribute, and the burden would not fall so heavily on a few generous citizens who contribute more than they should, to get the amount needed. —WM. C. BETZ, *Master Mechanic, Fafnir Bearing Company.*

No Parking

No concern is obliged to furnish free parking space for the use of employees, but the majority, where space permits it, do so with benefit to themselves and to the worker.

The knowledge that one's car is safely parked is a distinct relief to the average car owner in these days of parking restrictions. With this worry eliminated, the worker can concentrate on his job.

One concern I know of solved the parking problem this way: No parking was allowed in the street, and the nearest parking space was privately owned, so the executives and men got together and negotiated with the owner of the parking ground for a reduced weekly rate. As most of his business was done outside of factory working hours, and he had space vacant during the day, he was glad to grant one. When the plan was finally put into operation, the cost to each workman averaged a trifle over fifty cents a week and everybody was satisfied. —ROBERT S. ALEXANDER, *Universal Winding Company.*

In the Driver's Seat

Each mistake should be called to the attention of the mechanic making it. This should be done in a quiet manner, not by "bawling" the man out in front of other men. If he is "bawled" out he will resent it and will probably answer back, in which case the foreman gets mad and fires a man who might turn out to be a good mechanic if handled right.

From the workman's point of view, I believe he would feel safer with the first type of foreman because, if he is the right kind of man he will realize that the foreman is trying to help him, whereas with the second type of foreman a man would not know he was making any mistakes and would think his work entirely satisfactory until suddenly he found himself out of a position.

—J. WALTER WRIGHT, *Assistant to President, Wilmot Fleming Iron & Steel Company.*

Boss, or Advisor?

I am sure Al is right: I have been up against the same proposition many times. Nearly every workman under a foreman's care, as I call it, must be analyzed, his disposition taken into consideration together with his individual opinion regarding disobedience of shop rulings. The man involved in such a case as this should be taken aside or called into the foreman's office and dealt with beyond the hearing of others. One can be firm, but one must show kindness in one's dealings with others.

—ERNEST MASON.

Honest Graft

The shop does not make much fuss about educating men to use tools, and it pays them for breaking them and spoiling material. Of course, this is done in the hope that the man may some day earn his wages and perhaps be a reliable and valuable man.

If a man is paid to learn other things that are necessary to industry, it may be casting bread upon the waters—or only in the ash can. Somebody must pay the bills for education, and usually a learner who is willing to pay his own bill is an asset either in the shops where he learned, or elsewhere. It is good advertising for a shop to turn out good men although their services may be lost.

A good mechanic is likely to be a good citizen, and this country has need of good citizens.

—C. D. MICHENER, *Foreman, Diamond Drill Contracting Company.*

Trade Secrets

Pride and secrecy are usually close associates. A man is proud of "that something" which he possesses that no one else has but would like to possess. This is even more true if he is the originator and sole possessor of the secret.

Few of us are capable of recognizing the true value of a secret formula. Usually we overestimate its value, only to find that someone has a product equal to or better than our own. After becoming aware of this fact, there is little or no sense in keeping it a secret merely because of pride.

Every man is entitled to his own opinion; likewise to his own secret formula. It may take a man many hours of constructive consideration to evolve his trade secrets. If a man can commercialize his trade secrets and make money with them, that is his good luck. Very few people are interested in what the Austrian glass blower used so successfully. Only his competitors and some art students care. The public is interested in ordinary things that affect every-day comfort. Science is taking good care of the public in eliminating trade secrets and reducing them to standards.

If a man develops an idea associated with his work, I believe his employer should be entitled to the greater part of its value. It is hardly fair that this man should be the sole possessor after having the opportunity of working for the company and using the knowledge the company collected during years of experience and research. If he feels that his idea means so much to him, he should resign his position and paddle his own canoe with his trade secret. —W. H. SCHOEMER.

MULTIPLE-JOINT BRAZING IN HYDROGEN ATMOSPHERE

H. M. WEBBER
Industrial Department,
General Electric Company

Fig. 3—Fabricated camshaft composed of individual parts assembled on a steel tube, copper brazed

Fig. 4—Tungsten-carbide-alloy tool, copper brazed in a furnace with hydrogen atmosphere

IN THE preparation of a subject for brazing by this method, copper is placed near the joints to be brazed during assembly of the parts. It can be applied in any convenient form, such as wire, chips, ribbon, powder, or paste. Boronized copper is theoretically preferable from the standpoint that the oxygen contained in ordinary copper combines with the hydrogen, forming tiny steam pockets which explode and spatter the copper slightly, but in practice ordinary copper wire is commonly used with very good results.

A very satisfactory copper paste can be made up for daubing around joints to be brazed, by mixing pure copper powder with pyroxylin and thinner. This method of applying the copper is somewhat more expensive than that of putting on copper wires or ribbon, both from a labor and from a material standpoint, but the fact that the copper paste is used almost as much as the other forms of copper demonstrates its convenience.

Since the copper brazing temperature is rather high, presenting special problems in the design of furnaces and supports for the work, the question frequently arises as to why low-melting copper alloys cannot be used in the furnace application with equally good results. In answer it may be said that in general the use of such alloys is not practicable. Copper alloys containing zinc are particularly injurious because the zinc volatilizes readily, contaminating the furnace atmosphere, and condensing in the insulation, furnace shell, and cooling chamber. The necessity of renewing the brickwork and scraping the shell are ultimate consequences. Perhaps the greatest disadvantage of using such an alloy, however, is the inability to control its melting point. As the zinc boils away, the melting point of the alloy rises, and the alloy will solidify if a higher temperature is not maintained. With the higher temperature, more zinc distills off, requiring a still higher degree of heat to retain the brazing metal in its liquid state, until eventually the point is reached where nothing but pure copper is left, requiring, of course, a furnace temperature of about 2,100 deg. F. for best flowing conditions.

Lead is also an enemy to the copper brazing process, because it volatilizes readily and a trace of it in the furnace atmosphere plays havoc with the possibilities of obtaining a good braze.

Tin in an alloy with copper gives no particular trouble from volatilization, but it does make the molten alloy less fluid than pure copper. Embrittlement in the joint is a noticeable characteristic, which of course impairs the strength.

Similar undesirable effects are caused by adding other low-melting metals to the copper, and since pure copper gives such uniformly good results with properly designed equipment, it is recommended that pure copper always be used.

Occasionally it is desirable to confine the flow of copper within certain areas to prevent its accumulation in machined sections such as threads, holes, etc. To meet this requirement several materials are available which can be painted on the zones to be protected. Of these substances, whiting is the most popular and the least expensive. When mixed with water, whiting can be applied with a small brush, and since copper does not wet its surface the whiting becomes a barrier to the flow of the brazing metal. After parts are taken from the furnace the whiting can be removed from the threads, etc., with a stiff brush, leaving a clean, shiny surface untouched by copper. Another material used for this purpose is chromic acid; it is very effective, but more costly and harder to apply than whiting.

Processes subsequent to brazing sometimes require that copper adjacent to the joints be removed from the surfaces of the metal before parts go farther into the line of production. An ammonium nitrate solution bath nicely solves this problem, the amount of copper being removed by the process depending upon strength of the solution and time in the bath. Care should be taken

The second and last article. The first appeared in the *American Machinist*, page 697, Vol. 73.

not to allow parts to soak long enough to cause removal of copper from within the joints.

It will be noticed that pieces are assembled with tight fits before brazing so that they are self-supporting, and when going through the furnace no supports are necessary for holding the separate parts together. Care should be taken when choosing possible applications for copper brazing, to see that the work has this feature. Tack welding is frequently an aid in holding parts together, so that the assemblies will not fall apart under lubrication of the joints by the molten copper at high heat.

A camshaft made up of a mild steel tube, carburized cams, and an alloy steel gear blank, fabricated by the copper brazing process is shown at Fig. 3. The cams and gear blank are staked to the shaft when they are adjusted before brazing, so that there is no possibility of displacement within the furnace. Two machine tools made up with tungsten-carbide alloy inserts, are illustrated at Fig. 4. The tips are tack welded into steel shanks and then brazed.

The applications mentioned should emphasize the various possibilities of the copper brazing process, and indicate desirable features of construction of the parts. By making minor changes in design, articles which are being riveted, welded, machined, or cast can frequently be adapted for brazing with decided advantage. It should be understood that copper brazing is a process which lends quality to a product; like heat treating, its value must be considered by taking into account the advantages derived from its use. Parts which can be inexpensively spot welded for instance, and which do not need strength or a continuous tight joint, are not ordinarily brazed because spot-welding is cheaper. Riveting, resistance welding, line welding, arc welding, and atomic hydrogen welding also present, in many instances, cost advantages over copper brazing, either from the standpoint of operation, initial investment or both; but when several joints are to be made in one piece, copper brazing frequently becomes the cheapest process to use. As soon as appearance becomes important, however, or gas tightness, cleanlines, strength at the joint, an annealed condition at the joint rather than embrittlement caused by welding, good heat conductivity, or other features mentioned heretofore, become desirable, the copper brazing process should be considered.

Attractive cost savings can be made by substituting copper brazed assemblies of simple drawn and cut shapes for intricate machined parts of expensive construction—an effect which can perhaps best be illustrated and paralleled by the modern substitution of fabricated and welded parts for large expensive castings.

Development of the copper brazing process has been accompanied by a similar development of furnaces to handle the work. At first the experiments were done in laboratories with small "tube type" furnaces consisting of alundum muffles wound with molybdenum resistor wire. Each muffle was mounted horizontally with a water-jacketed cooling tube connected to one end for cooling the work after brazing, each chamber containing hydrogen. Experimentation with copper brazing in this type of furnace dates back to 1906, and many of the same furnaces are being used by laboratories today.

The process is inherently an electric application, because the desired atmospheric control cannot be obtained in fuel-fired furnaces without utilization of alloy retorts. Such retorts at the brazing temperature are quite impracticable.

In 1920 a furnace of the lift-cover single-chamber type was installed in one of the General Electric factory buildings. That furnace is operating continuously to this day, along with its more modern successors. When the furnace is cold its cover is removed, a charge is lowered into it with a crane, the cover is replaced and bolted down, the chamber is filled with hydrogen, and the entire mass of charge and fire brick inner walls is heated to brazing temperature, only to be cooled down again with accelerated cooling, before the chamber is purged with nitrogen and the cover removed. The cycle takes over two days, which proved to be too slow and costly for production requirements. Later, therefore, a small three-stage furnace was developed, which will heat work in two to three hours and cool it in an equal period. However, the load in this furnace is much lighter than that in the big single-chamber furnace. The speed of the three-stage furnace is due to the fact that a bell-type heating chamber is kept hot at all times, ready to be set down upon each fresh charge that is placed beneath it. The operation is accomplished by means of a turntable supporting three circular loading platforms spaced 120 deg. apart. When the heater bell is lifted the hot brazed charge beneath it is rotated 120 deg. to a position beneath a water-jacketed cooling hood which is equipped with a fan in the top. A hydrogen atmosphere is maintained in both the heater and cooler, and when the hoods are lifted from the turntable the hydrogen comes in contact with the air, a burning mixture being formed. This mixture is ignited by illuminating gas pilots, and while the hoods

Fig. 5 — Three-stage brazing furnace with hoods in lowered position and next charge in place

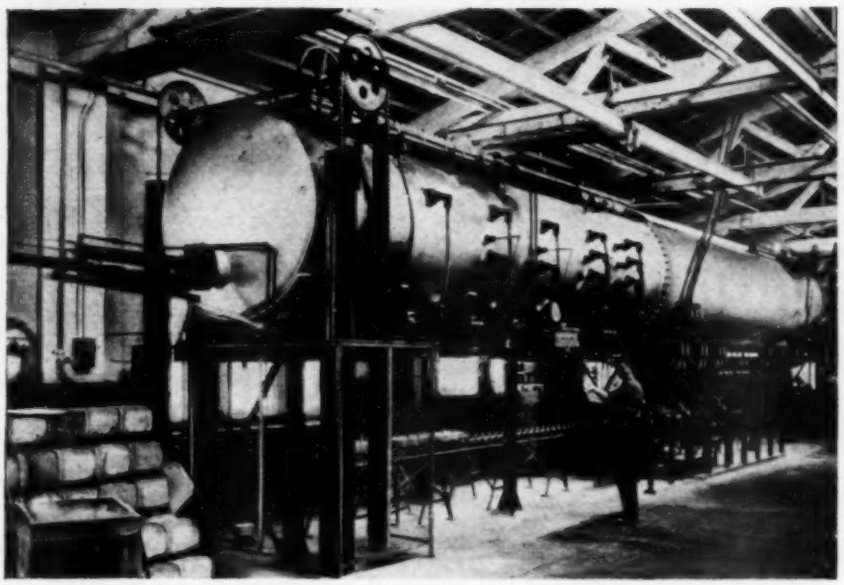


Fig. 6—Semi-continuous tunnel type furnace for brazing refrigerator evaporator cases

are in the elevated position a sheet of flame burns beneath them. In this way the oxygen which mixes with the hydrogen is consumed, and when the hoods are lowered onto a seal the flame goes out.

Since the transfer of the hot brazed charge from heater to cooler must be made in air, oxidation takes place which, in turn, is counteracted and reduced in the hydrogen cooler with the assistance of heat retained in the work. To minimize difficulties encountered by this oxidation, the heater temperature is always dropped before shifting, frequently to 1,650 deg. F. With light work that shifting temperature is used, but if the charge is heavy the transfer temperature need not be so low because the heat retentivity is better and the oxide reduction can be accomplished before the parts cool off. The two- to three-hour heating cycle depends upon weight of charge, and includes time to heat up from 1,650 deg. to 2,100 deg., and down to 1,650 deg. again. A period in the cooling chamber for an equal duration means that about 6 hours are required to braze and cool a heavy charge in this furnace.

Modifications in design soon followed, with the result that three larger furnaces of the three-stage type shown in Fig. 5 are now working continuously, each having a motor-operated turntable. Two of these furnaces have 6½ ft. diam. loading platforms, and the large one has 12 ft. diam. platforms, as compared to the 28 in. loading area in the small three-stage furnace described above. The 6½ ft. furnaces run on a 4½- to 6-hour cycle, while the large one uses a 5- to 12-hour cycle, depending upon the weight and shape of the charge.

To meet the demands of a large uniform production of refrigerator evaporators, the semi-continuous tunnel type furnace shown in Fig. 6 was designed and built several years ago. This furnace, with approximately the same kw.-hr., gas, labor, and initial cost as its three-stage neighbor shown in Fig. 5, brazes about 600 evaporators per 24-hour day, while the 6½-ft. diameter three-stage furnace turns out 150 pieces during the same period.

The semi-continuous furnace is about 60 ft. long, the first 20 ft. being the heating end and the next 40 ft. the cooler. The entire unit is built into a steel shell 6 ft. in diameter, and elevated above the floor with supports suitable to allow a loading conveyor to run beneath the entire length of the furnace. An elevator platform closes an opening in the bottom of the furnace at each end, these elevators being arranged so that they can be dropped to the loading conveyor level. In the lower position, a car with work to be brazed may be rolled onto the charging elevator and raised up into the receiving end of the furnace, where a hydraulic pusher moves the car into the heating chamber, pushes the train of cars into the furnace one car length, and rolls the last car onto the discharge elevator. A throat 4 ft. long between the heating and cooling chambers is always blocked off by two cars of the train, so that a minimum of heat transfer goes on between the two chambers.

The cars travel in a passage beneath the heating chamber on a conveyor, and work is carried through the heat on supports which extend up from the cars through a longitudinal slot in the floor of the heating chamber. The supports which extend into the heat are made of nickel-chromium castings, as are the cars and conveyor.

When the discharge elevator is lowered, the car is rolled off onto the loading conveyor, and the empty elevator is then raised, putting the furnace in readiness for another charging cycle. Finished work is removed

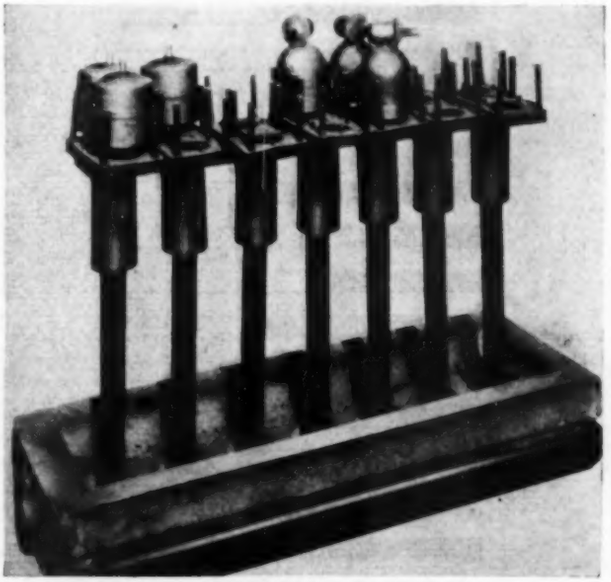


Fig. 7—Car for automatically operated semi-continuous tunnel type brazing furnace

from the car; new work is placed upon the supports, and the car is moved along the conveyor to the charging end of the furnace by the furnace operator.

A five-minute cycle is usually maintained in the charging of these furnaces, and the output of each furnace with such operation is about 500 lb. net per hour, at a power consumption of about 180 kw.-hr. per hour, giving a net economy of a little over 2½ lb. per kw.-hour.

AMERICAN MACHINIST 1930 INVENTORY

of Metal-Working Equipment

THE INVENTORY of five years ago did not report this group nor anything comparable to it. The following equipment is included: cement and concrete machinery, dredging and excavating machinery including power shovels, and road-making machinery. Plants making construction equipment contain only slightly over nine thousand units of metal-working equipment which is below that for any division reported excepting aircraft. The industry is, however, of sufficient importance to merit attention.

The 52 per cent of old equipment shown is 8 points higher than the 44 per cent average for all industries

Report No. 13—Machines used in the manufacture of construction and cement-making equipment

obtained in 1925. The extensive construction programs now under way by governmental and private agencies should stimulate the demand for the products of this industry. It would be timely for makers of construction equipment to survey the physical condition of their plants to determine whether they are in shape to meet efficiently this demand.

Machines in Plants Making Construction Equipment

	Total Number in Plants 1930	Number Installed Before 1920
LATHES		
Engine	1,005	564
Hand Turret	194	115
Power Turret	282	132
Automatic and Semi-Automatic	18	18
Chucking (Not Chucking Machines)		
Speed and Bench	35	18
Crankshaft		
Toolroom Type	79	71
Other		
CHUCKING MACHINES (Not Chucking Lathes)		
SCREW MACHINES		
Hand	53	18
Automatic, Single Spindle	44	
Automatic, Multiple Spindle		
CENTERING MACHINES	62	53
MILLING MACHINES		
Hand (No Power Feed)	26	9
Bench	9	
Plain (Knee and Column Type)	203	115
Universal (Knee and Column Type)	194	123
Vertical (Knee and Column Type)	26	26
Lincoln Type Manufacturing	25	9
Continuous, Rotary Table or Drum Type		
Planer Type	18	
Other	18	9
GEAR CUTTING MACHINES		
Rotary or Milling Type	71	26
Hobbing	88	35
Planing or Shaping	26	18
Other	26	
BORING MACHINES		
Horizontal Boring, Drilling and Milling	176	106
Vertical Boring Mills	203	88
Other		
JIG BORERS		
DRILLING MACHINES		
Radial	405	229
Upright, One Spindle	881	511
Upright, Two or More Spindles	53	26
Upright Gang (Two or More Heads)	26	18
Sensitive, One Spindle	106	35
Sensitive, Two or More Spindles	35	26
Sensitive Gang (Two or More Heads)	9	9
Two, Three and Four Way	9	9
Other		
THREADING MACHINES		
Single Spindle Tapping	9	
Multiple Spindle Tapping		
Pipe Threading and Cutting	53	44
Bolt Threading and Cutting	88	35
Thread Chasing	35	35
Thread Hobbing and Milling		
Thread Rolling		
Other		
PLANERS		
Open Side	44	35
Double-Housing	141	97
SHAPERS		
Vertical	35	26
Horizontal	212	106
Slotters	26	26
KEYSEATING MACHINES	167	123
BROACHING MACHINES	35	18
GRINDING MACHINES		
Plain Cylindrical	141	79
Universal Cylindrical	115	62
Surface, Reciprocating	18	18
Surface, Rotating	26	18
Internal		
Crankshaft		
Cutter	44	18
Floor, No Feed Attachments	379	2 9
Bench, No Feed Attachments	44	26
Abrasive Disk	53	35
Abrasive Belt	53	
Centerless	88	44
Other		
POLISHING AND BUFFING MACHINES		
(Including those in Plating and other Depts.)		
Abrasive Wheel, Hand Operated	18	18
Abrasive Belt, Hand Operated		
Automatic and Semi-Automatic	18	
LAPPING MACHINES		
HONING MACHINES		
CUTTING-OFF MACHINES		
Parting Tool Type	9	9
Power Hack Saw	317	167
Rotary Cold Saw	71	44
Bandsaw	44	13
Other	9	
WIRE FORMING MACHINERY		
Spring Coiling		
Other		
WELDING AND CUTTING MACHINES		
(See also Welding and Cutting Outfits)		
Resistance Welding, Butt	9	
Resistance Welding, Spot	9	
Resistance Welding, Seam		
Resistance Welding, Other		
Arc Welding	238	18
Electric Cutting		
Gas Welding	106	44
Gas Cutting	53	9
RIVETING MACHINES, STATIONARY		
Pneumatic	203	44
Hydraulic		
Power	9	
PRESSES		
Punching Machines	132	53
Combined Punches and Shears	185	132
Hand, Arbor	88	71
Hand, Light Punch Press Work	26	18
Foot, Light Punch Press Work	9	
Power, Crank Type	71	18
Power, Toggle Type		
Power, Double Acting		
Power, Dieing Type	18	
Power, Trimming Presses		
Power, Forcing, Arbor, Wheel	18	9
Hydraulic, Bending, Forming, Drawing	26	
Hydraulic, Wheel Forcing, etc.		
Baling, Power and Hydraulic		
Other	18	
BENDING AND STRAIGHTENING MACHINES		
Bending Brakes	141	44
Bending Rolls, Horizontal	220	115
Bending Rolls, Vertical	9	
Straightening Rolls		
Other		
SHEARS		
Knife	220	19
Rotary, Slitting	106	44
NIBBLING MACHINES	9	9
HAMMERS		
Drop		
Helve	106	35
Spring	53	53
Steam	53	35
Pneumatic (not portable)		
Other	26	18
FORGING MACHINES	115	97
Bulldozers	9	9
Hot Forging Machines		
Cold Headers, Bolt, Nut, etc.		
Cold, Swaging		
Forging and Flanging Presses, Hydraulic		
Other Forging Machines	26	
Total	9,009	4,690

IDEAS FROM PRACTICAL MEN

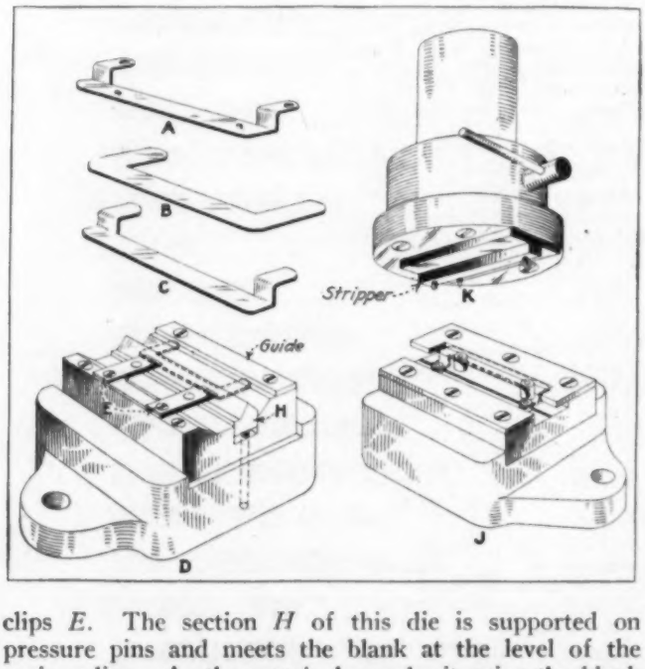
Press Tools for Forming and Piercing a Small Part

CHARLES H. WILLEY
Superintendent of Manufacturing, Hoyt Electrical Instrument Works

IN OUR factory, one of our hardest problems is to keep down the costs of punches and dies for small-quantity jobs in the manufacture of a much-varied line of electrical measuring instruments. Such instruments are being continually changed in design, so that tools for some of the parts become obsolete very quickly. Until an instrument has proved its worth as an article of manufacture, tool costs must be kept at a minimum.

For this reason, I am always interested in the simple, or economical, side of small-tool designing, and I sincerely wish that more of the toolmakers who read the *American Machinist* would contribute their ideas to its columns. Personally, I have reaped a lot of benefit from the exchange of ideas in the technical press, and those for whom I have worked have profited by my added store of knowledge of practical ways of getting their work done.

Parts like the one shown at *A*, made from $\frac{1}{32}$-in. soft sheet-brass, were required in but a small quantity, yet the demand was sufficient to warrant us in making the tools described. The parts were blanked, as shown at *B*, in a straight-through die and were then formed, as at *C*, in the die *D*, the blanks being held by the two spring



clips *E*. The section *H* of this die is supported on pressure pins and meets the blank at the level of the spring clips. As the punch descends, it grips the blank at this point and carries both it and section *H* of the die to the end of the stroke, completing the forming. Next, the two holes in the ears and the two holes in the bar are pierced in one operation by the tools *J* and *K*. While the holes in the ears are cleanly punched, the holes in the bar are pierced by pointed punches that push through the metal, forming eyelets that are afterward tapped for screws.

The piercing die consists simply of four tool-steel bushings set in a mild-steel base stepped in height to the shape of the work, suitable guides being attached to locate the piece. The stripper set in the punch is operated by a cam, the lever of which strikes a back bar on the press frame during the upward stroke of the ram.

■

Cutting Perfect Threads—*Discussion*

O. D. BRADSHAW
East St. John, New Brunswick

Threads on gages and taps must be smooth, and perfect in shape. They must also be produced within a reasonable time when made singly or in small lots. My experience in cutting such threads is as follows: I grind my tool with an included angle of approximately 56 deg. with a slight rake on the forward cutting edge.

I swing the compound rest to 30 deg. and set the tool to the proper angle. I then set the cross-feed dial at zero.

In feeding I use the compound rest and do not back it up, but use the cross feed for that purpose, returning the dial to zero each time.

When within a few thousandths of the proper depth I shift to a spring tool ground accurately to 60 deg. The top of this second tool is set at the center line of the work, and has no top rake.

I use a cutting compound with this spring tool and the finished thread is mechanically perfect.

When I am making an inserted blade type of tap, I use a solid tool instead of a spring tool.

■

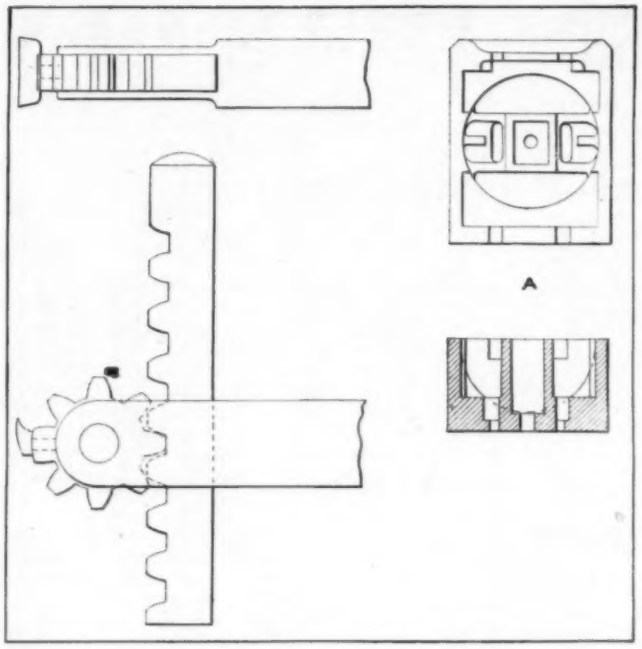
A Rotary Chisel

H. LAWRENZ

The small model part illustrated at *A* is made of hard rubber and has two recesses $\frac{1}{2}$ in. deep with $\frac{1}{2}$-in. radii. To finish these surfaces, I devised a rotary chisel. The holder consists of a piece of machine steel in which a slot is milled to fit a section of rack having one end rounded and hardened.

The arms of the yoke thus formed are drilled to provide bearings for a small pinion, one tooth space of which is omitted. A hole drilled in the pinion, at the center of the missing tooth space, holds a cutter. The toolbit is hardened, driven into this hole, and ground by hand. Since the toolbit is wider than the shank, it is possible to cut as deeply as desired.

In machining the hard rubber block, I chucked it in a



lathe and clamped the shank of the rotary chisel in the toolpost. The cuts were made by striking the upper end of the rack lightly with a small hammer. The carriage was backed away after each cut, using the compound rest to feed a few thousandths each time. The cuts were made slightly deeper than the required dimensions to allow finish on the flat surface which made possible the removal of any broken edges caused when the tool broke through.

■

An Improvement in Taps—*Discussion*

JAMES PEARMAN
Tool Engineer, R. Hoe & Company, Limited
London, England

Referring to the article under the title given above, by Charles A. Pease, on page 62, Vol. 73, of the *American Machinist*, I would like to point out that in my opinion the improvement described is unsuitable as a commercial proposition. The objections are as follows: (a) The tap illustrated is useless unless it is machine relieved on the whole length of the thread. A glance at the diagram shows this. How is this possible, commercially, for small sizes, say below $\frac{3}{16}$ inch? (b) Seeing that the taper portion of the tap runs into the parallel portion, how are both portions to be cut unless a special former is used, since the two portions must merge in a continuous helix? (c) The threads on the taper portion must be at right angles to the axis, and not to the surface of the taper, making an exceedingly difficult form to relieve, since one flank will be longer than the other. Of course, I am assuming that a quality product is required. (d) By experience in thread cutting and gear hobbing as a commercial proposition I have come to the opposite conclusion to that advanced by Mr. Pease. It is beneficial to take the heavy cut when roughing, leaving a light chip to be taken when finishing, thereby dissipating the heat due to cutting when the thread is being roughed. As the work progresses, the cutting decreases and a clean thread without distortion is the result.

Taps similar to Mr. Pease's improved tap were made at the Enfield Armory more than 25 years ago, when I was a young toolmaker there, but owing to the objections outlined above, the idea was soon dropped and eventually forgotten.

Has Mr. Pease compared the cost of manufacture and performance over a period of commercial production? If he has, I am sure that he will agree with me.

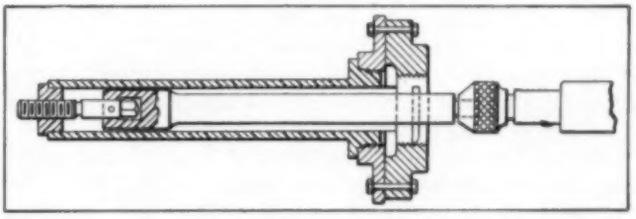
■

Chasing a Thread Without a Lead Screw

R. B. WARE

Sometimes we think we cannot do a certain job because we have not the necessary tools, but if we look around a bit and use our heads, we can oftentimes pick up something right at hand that will answer the purpose, and so get the job done.

I once had occasion to bore and thread a flange, and having only a lathe without a lead screw, I figured that I could use a tap to guide the tool. Accordingly, I rigged up for the job as shown in the illustration. A tapped plug was fitted tightly in the rear end of the hollow spindle. The shank of the tap was let into a hole in the end of the boring bar and secured by a pin, the pin being at a right angle with the cutter in the other end of the bar. A drill chuck in the tailstock spindle aligned and supported the free end of the bar. When boring the flange, the tap was removed, leaving the boring bar free to travel endwise, being fed by the screw of the tailstock



spindle. When chasing the thread, the tap was put in place and the screw was removed from the tailstock spindle, permitting the spindle to move endwise as the tap advanced in the hole. The key in the spindle prevented it and the boring bar from turning as the live spindle revolved. When the chuck was loosened from the bar and slipped back, the bar could be swung on the pin by which it was attached to the tap, permitting the cutter to clear the threads in the flange on the return movement. The flange was, of course, attached to the faceplate in the usual manner.

■

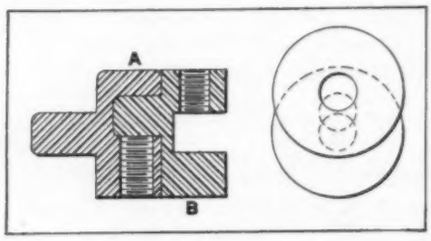
An Offset Holder for Boring Tools

A. F. FONTENALLA

A small offset holder for a boring tool, such as is shown in the illustration, will be found very convenient for boring small holes in work held on the table of the milling machine.

The part *A* has a shank for holding it in the chuck. In the larger part is drilled a hole $\frac{1}{2}$ in. in diameter and

$\frac{3}{16}$ in. off center. Part *B* has a shank, $\frac{3}{16}$ in. off center, and turned to fit the hole in part *A*. A $\frac{1}{2}$-in. hole is drilled in the center for the boring tool. Both parts have crosswise holes tapped for safety setscrews, one for holding the two parts together, and the other for holding the boring tool. A brass disk is placed under the point of the setscrew in part *A* to prevent burring the shank of the mating part when setting the tool.



By slacking the setscrew in part *A*, part *B* can be rotated, bringing its hole off center. Therefore, a tool held in the hole can be offset for boring holes of different diameters. The maximum amount of offset is equal to the sum of the off-center distances of the hole in part *A* and the shank on part *B*, as can be seen in the diagram at the right. A series of lines on the periphery of part *B*, coinciding with a zero line on the adjoining face of part *A*, indicates how much part *B* has been rotated. Split bushings are provided for tools having shanks less the $\frac{1}{2}$ in. in diameter.

■

An Adjustable Angle Plate—*Discussion*

T. Bonsall
Earlswood, England

The angle plate described by Albert Feucht, in an article under the title given above, on page 852, Vol. 72, of the *American Machinist*, is certainly useful, if not original. On a small scale, such angle plates are often to be found in toolmakers' kits.

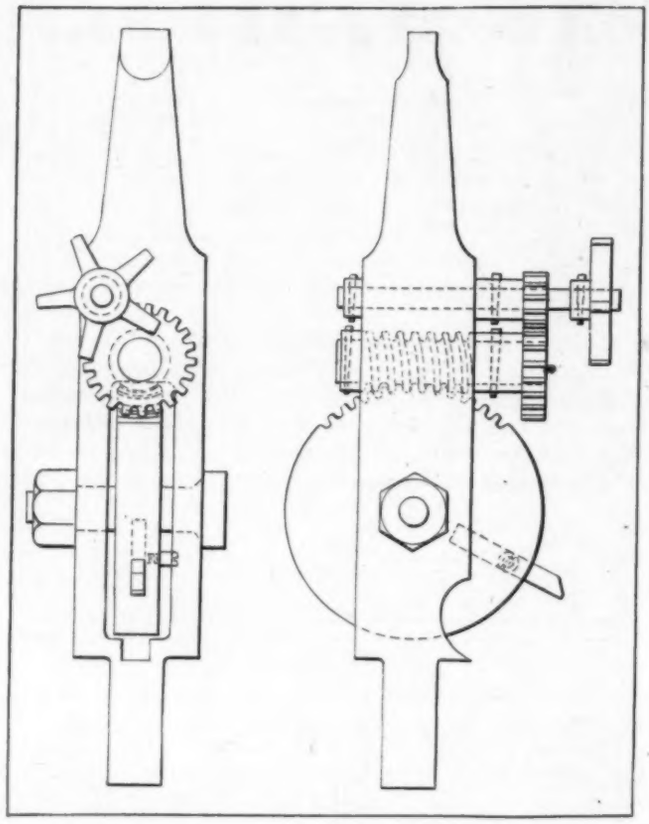
The reading of the article brought to mind that more than historic admonition, "One thing thou lackest." In this particular case, the one thing lacking is a sine button, omitted from the swinging leaf. With such a button attached at a known center distance from the hinge, and truly in line with the hinge pin, a slip- or planer-gage could be used to obtain the proper setting for any angle. This method would insure near-enough accuracy for most purposes, avoiding the cut and try method, or the use of the protractor. Also, it would command the O.K. immediately, and put the angle plate in the precision class.

■

Boring Spherical Seats

George Odum
South Chicago Works

Having in mind the discussion on methods of machining concave and convex surfaces, I show in the accompanying sketch a tool that was built to bore spherical cavities in castings. It is, of course, seldom if ever necessary to have the sphere complete, so the body of the tool is usually made the size of the shank or body of the connecting member and does not interfere. In the present case it was also possible to drill a hole and employ a guide at the lower end to give



stiffness. Where necessary there is no reason why the cutting tool should not feed clear to the bottom center.

In this particular case the mating surfaces of the two halves were machined, the bolt holes drilled, and the two parts clamped together over the worm wheel of the fixture. By fixing a rod to the drill press to actuate the star wheel the rest of the operation took care of itself.

■

Setting Up Punches on a Multiple-Punching Head

William J. Tangerman
Shop Superintendent, Union Metal Products Company

In fabricating railroad car hopper doors and corrugated car ends it is necessary to punch a number of holes in one operation. This is done under a multiple-punching head on an ordinary punch press. In the conventional method of setting up, difficulties are encountered in locating and maintaining the punches and dies with sufficient accuracy to conform with standards inspection. This difficulty we eliminate by laying out a $\frac{1}{2}$-in. plate for each type of section. This plate is drilled to take the punch stems and is then bolted to the ram with the stems in place. Thus the ram acts as a backing plate for the punch stems and the drilled plate performs the double function of holding the punch stems tightly against the backing plate and of locating the punches properly. The die blocks are held with bolts in the T-slots of the bed in conventional fashion. By utilizing this method it was possible for us to standardize the sizes of our punch stems and to limit the use of punch-stem holders to the smaller single-end and double-end punches.

Revised Abbreviations for Engineering Terms

A SYMBOL is a letter or sign used in a formula as a substitute for any numerical value. A shortened expression for a name or a unit is an abbreviation and not a symbol. Abbreviations should be used sparingly in text, and with regard to the context and to the training of the reader. Terms denoting units of measure are abbreviated in the text only when preceded by the amounts indicated in numerals; thus "several inches," "one inch," "12 in." In tabular matter, specifications, maps, drawings, and texts for special purposes, the use of abbreviations is governed by the desirability of conserving space. Do not use conventional signs for abbreviations in text. Periods are eliminated except where their elimination results in an English word.

Alternating-current (adjective)	a-c
American wire gage (Brown and Sharpe)	Awg
Ampere	a or A
Ampere-hour	ah or Ah
Antilogarithm	antilog
Atomic weight	at. wt
Atmosphere	atm
Average	avg
Avoirdupois	avdp
Barometer	bar.
Barrel	bbl
Baumé	Bé
Birmingham wire gage	Bwg
Board feet (feet board measure)	fbm
Boiler horsepower	boiler hp
Boiling point	bp
Brake horsepower	bhp
Brake horsepower-hour	bhp-h
Brinell hardness number	Bhn
British thermal unit	Btu or B
Bushel	bu
Calory	cal
Candle-hour	c-h
Candlepower	cp
Center to center	c to c
Centigram	cg
Centiliter	cl
Centimeter	cm
Cent	c or ¢
Chemical	chem
Chemically pure	cp
Circular	cir
Circular mils	cir mils
Cologarithm	colog
Conductivity	cond
Constant	const
Cosecant	csc
Cosine	cos
Cost, insurance, and freight	cif
Cotangent	ctn
Cubic	cu
Cubic centimeter	cu cm, cc (liquid), cm^3
Cubic foot	cu ft
Cubic feet per second	cfs
Cubic inch	cu in.
Cubic meter	cu m
Cubic yard	cu yd
Cycles per second	~
Cylinder	cyl
Day	spell out
Degree	deg
Degree Centigrade	C
Degree Fahrenheit	F
Diameter	diam
Direct-current (as adjective)	d-c
Dozen	doz
Electric	elec
Electric horsepower	ehp
Electromotive force	emf
Feet per minute	fpm
Feet per second	fps
Foot	ft
Foot-candle	ft-c
Foot pound	ft-lb
Free on board	f.o.b.
Freezing point	fp
Frequency	freq
Gallon	gal
Gallons per minute	gpm
Gallons per second	gps
Grain	spell out
Gram	spell out
High-pressure (adjective)	h-p
Horsepower	hp
Horsepower-hour	hp-h
Hour	h
Hundred	C
Hundredweight (112 lb)	cwt
Hyperbolic sine	sinh
Hyperbolic cosine	cosh
Inch, or inches	in.
Inch-pound	in-lb
Inches per second	ips
Indicated horsepower	ihp
Indicated horsepower-hour	ihp-h
Intermediate-pressure (adjective)	i-p
Internal	int
Kilogram	kg
Kiloliter	kl
Kilometer	km
Kilovolt	kv or KV
Kilovolt-ampere	kva or KVA
Kilowatt	kw or KW
Kilowatthour	kwh or KWH
Lineal foot	lin ft
Liquid	liq
Logarithm	log
Low-pressure (adjective)	l-p
Mass	spell out
Maximum	max
Mean effective pressure	mep
Melting point	mp
Meter	m
Mile	spell out
Miles per hour	mph
Milligram	mg
Milliliter	ml
Millimeter	mm
Million	spell out
Million gallons per day	mgd
Minute	min
Molecular weight	mol wt
Ohm	spell out or Ω
Ounce	oz
Peck	pk
Penny (Pence)	d
Pennyweight	dwt
Pint	pt
Potential	pot.
Potential difference	pd
Pound	lb
Pound-foot	lb-ft
Pound-inch	lb-in
Pounds per square foot	lb per sq ft
Pounds per square inch	lb per sq in
Power factor	pf
Quart	qt
Radian	spell out
Revolutions per minute	rpm
Revolutions per second	rps
Round	rd
Secant	sec
Second	sec
Shaft horsepower	shp
Shilling	s
Sine	sin
Specific gravity	sp gr
Specific heat	sp ht
Square centimeter	sq cm or cm^2
Square foot	sq ft
Square inch	sq in.
Square kilometer	sq km or km^2
Square meter	sq m or m^2
Tangent	tan
Temperature	temp
Tensile strength	tens str
Thousand	M
Ton	spell out
Ton-mile	spell out
Versed sine	vers
Volt	v or V
Watt	w or W
Watthour	wh or Wh
Watts per candle	wpc
Weight	wt
Yard	yd
Year	yr

Abstracted from the latest revision of the proposed American Standard Abbreviations for Scientific and Engineering Terms

© American Machinist

American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

New York, November 6, 1930

VOL. 73 No. 19

Studying the Industrial Market

IN THE 1930 census, for the first time, an effort is being made to cover the industrial market. Some idea of the size of this market may be gained from the fact that of the five thousand industries listed by the census more than half sell their output to other industries instead of to the consumer.

One of the important groups in this aggregation of industries is the machine tool building industry. At its recent convention the trade association of this industry voted to spend an appreciable sum in studying its markets. The effort is to be a continuing one rather than a sporadic attempt to help itself during a depression. The move is timely and it will unquestionably uncover much valuable information for its originators.

Co-ordination of the facts discovered by individual industries with those brought out by census figures will go far to reduce the depth of the valleys in the business cycle, provided, of course, that a generation of administrative executives who will act on facts instead of on emotional reactions can be developed before the next business depression.

Speeding-Up

IN THESE times speeding-up of everything seems to be inseparable from progress. Now comes a means of speeding-up the imparting of knowledge and the transfer of skill. By means of the sound motion picture the medical profession is recording for all time the skill of the greatest surgeons of the day. So perfect are the means of recording sound and action that the spectator forgets that he is not a part of what is going on on the screen, and the lasting impression of what he sees is a new experience in acquiring information.

Surgical subjects are naturally of vital interest to all of us, and therefore it is likely that the film recording operating technique will make a deeper and more lasting impression than would films depicting other activities. Nevertheless, the sound motion picture offers a means of imparting information and recording skill that has no parallel today. By means of it, there is every reason to believe, educational processes of all kinds can be greatly speeded up, not only in schools and colleges but in industry as well. Developments in this field will bear the closest watching.

Not all speeding-up processes are an unmixed blessing, by any means. In the shop, particularly, certain methods of speeding-up are justly in very bad odor. Even the most hardboiled labor leader, however, could hardly object to a speeding-up of the process of imparting skill to a worker.

A business depression is not the best time in the world to propose methods of training employees because the thoughts of the executives are mostly occupied with means of keeping as many men on the payroll as possible. But new developments come along most rapidly when production is slack. This one may be of academic interest only, just now, but it may well be practical enough in a few months.

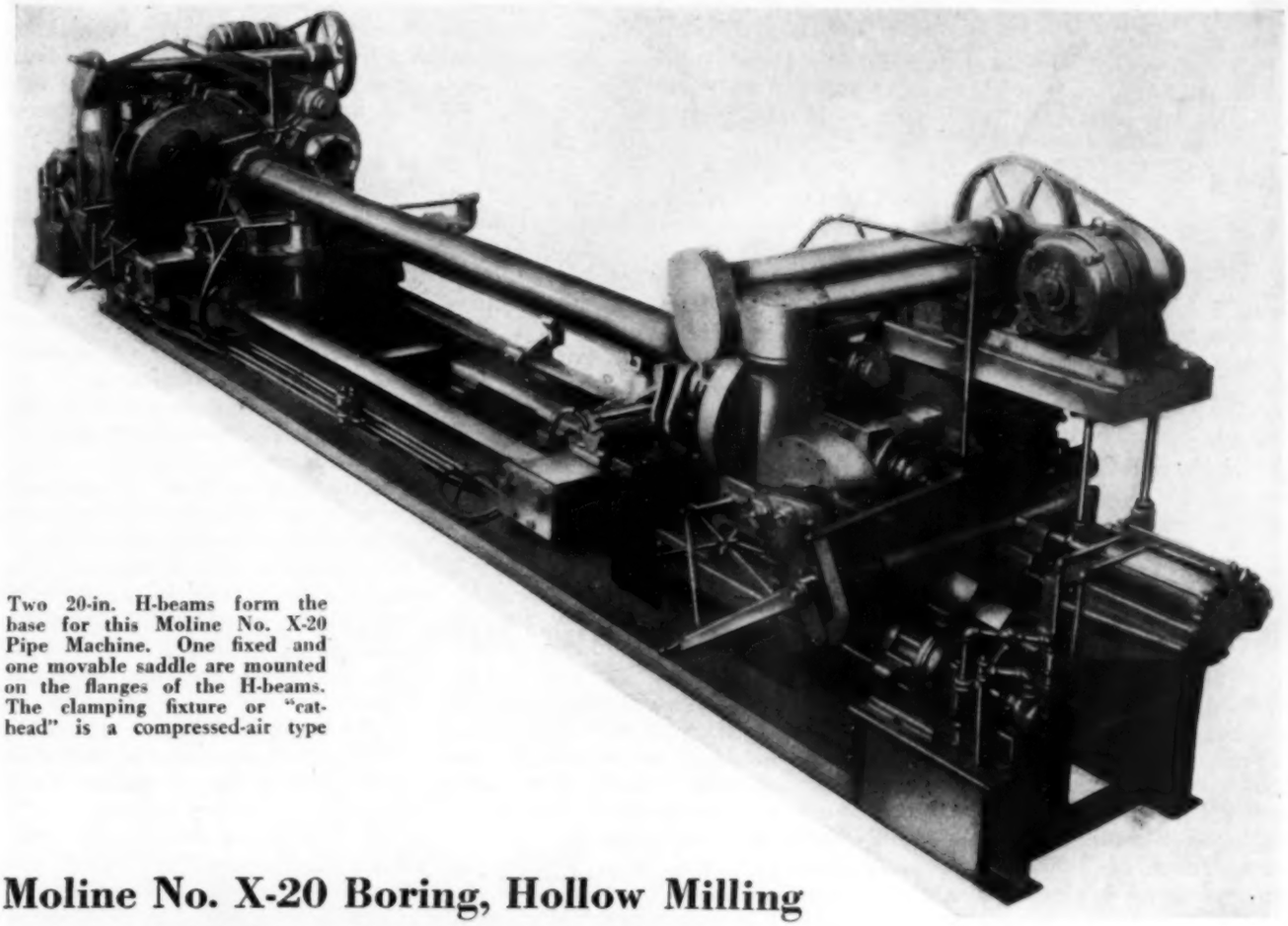
Time to Retire

A FRIEND has just sent in a clipping from a business paper which says that an employee of an old eastern company has rounded out sixty-one years of service, fifty-five of them at the same planer. Contemplation of this record gives rise to mixed feelings. One is moved to admiration of the tenacity of the man; to astonishment that even a planer should be kept in service for so long a time; to grave doubts of the progressiveness of a management that would countenance such a condition.

Possibly the management endeavored to improve on the accomplishments of this man and his machine, and discovered that he had lived with it so long and become so skillful in handling it that more modern machines with less skillful operators could not exceed his records appreciably. Such things have happened, but one is inclined to doubt that this case falls in that class.

Anyone who has seen what a modern planer can do will be tempted to suggest, with all due respect to a faithful and venerable employee, that he be mounted and sent with his machine to a museum where such honored relics belong.

SHOP EQUIPMENT NEWS



Two 20-in. H-beams form the base for this Moline No. X-20 Pipe Machine. One fixed and one movable saddle are mounted on the flanges of the H-beams. The clamping fixture or "cat-head" is a compressed-air type

Moline No. X-20 Boring, Hollow Milling and Threading Machine for Cast-Iron Gas Pipe

Whereas calking is the usual manner of assembling cast-iron gas pipe, by means of the No. X-20 pipe machine developed by the Moline Tool Company, Moline, Ill., such pipe may be machined for screwing together. This special machine will ream, hollow mill, tap, and thread the bell and spigot ends of 5-, 7- and 9-in. diameter pipe from 6 to 16½ ft. long.

The bed, as shown in Fig. 1, is built up of structural steel, consisting of two 20-in. H-beams 28½ ft. long, tied together by short I-beams welded

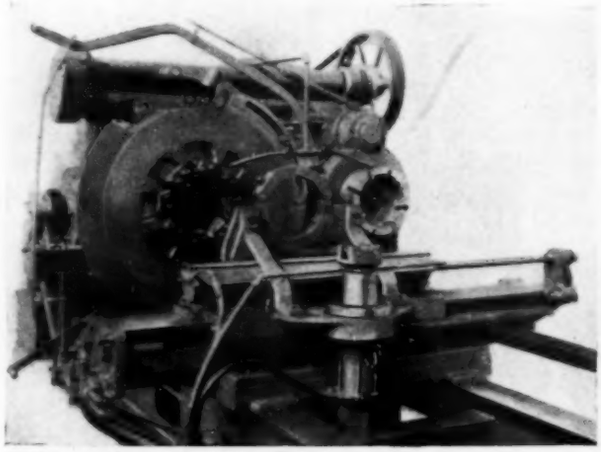


Fig. 2—Fixed left-hand head

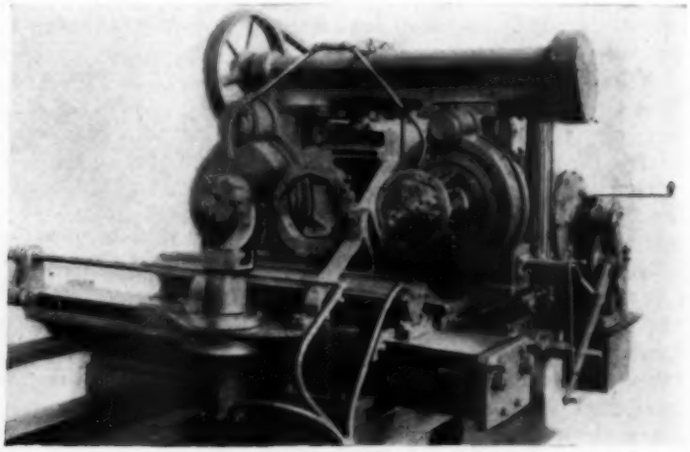


Fig. 3—Adjustable right-hand head

36 in. apart. Necessary brackets and bearings are bolted to this structure before the entire unit is machined.

Two saddles are carried on this structural steel bed. The left-hand saddle, shown in Fig. 2, is located permanently on the bed, whereas the right-hand saddle, shown in Fig. 3, is adjustable for different lengths of pipe. These two saddles carry spindle units on double V-bearings, and the spindle unit feeds in to give the travel to the tools. Quick traverse of the feed is derived from the oil pump units on either end of the machine.

Between the two spindle units are cross heads carrying the work fixture. The pipe is held in a clamping fixture known as a "cat-head." These cross heads have their traverse movements controlled by air. The cycle of operation is as follows: the two vertical cylinders are raised by an air valve on the front end of left-hand cross head; the pipe is then lifted into position by a crane or conveyor and dropped into the V-blocks on the ends of the pistons; and finally, the pipe is lowered into the cat-head and clamped in position.

Beside the valve controlling the vertical travel, there is also a valve controlling the horizontal travel of the pipe after it is in the fixture. The cross heads are brought up against a positive stop, locating the pipe in line with the two rear spindles. On one end of the machine a hollow milling operation is performed, while on the other end the pipe is bored. Upon completion of this operation, the cross heads are traversed forward in line with the two front spindles. On one end of the machine the pipe is threaded externally, and on the other end the pipe is tapped.

Niles 42 to 50-In. Side-Head Boring Mill

To meet the demand for a machine of larger capacity than its 36- to 44-in. side-head boring mill, The Niles Tool Works Company, Hamilton, Ohio, has brought out a 42- to 50-in. model of the same general design. It employs a one-piece base and column, which is machined on a special tool to insure accuracy. After the ways for crossrail and side head are planed and scraped, these surfaces are used for locating the casting on the special boring machine, where the spindle hole and taper thrust track are finished, as well as the bored hole for the main drive shaft. These special operations insure the spindle being parallel to the ways and the main drive a true right angle to the spindle, so that precision boring can be done.

The crossrail has a three-track bearing surface with a narrow guide for the vertical head saddle. The screw for the longitudinal motion is placed between the two lower tracks, to prevent cramping of the saddle under heavy feeds.

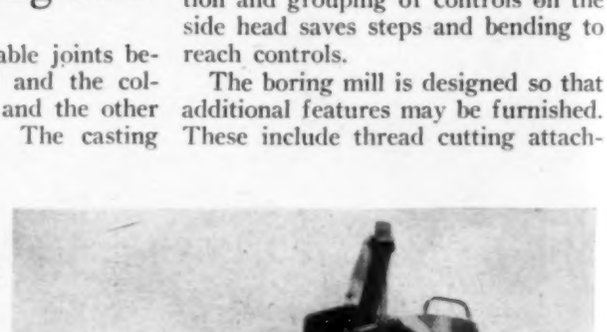
Bearings of the square-lock type are provided for the vertical head, with taper gib adjustments in all directions, so that wear is taken up and alignment maintained between turret and table spindle. The side head is an entirely independent unit. It is attached directly to the column, and there are but two movable joints between the cutting tool and the column; one for vertical and the other for horizontal travel. The casting extends across the column and has three bearings; the main bearing on the right-hand side with a long and narrow guide and two flat bearings—one in the center and the other on the left side of the column. All bearings are of the square-lock type.

Both heads have rapid traverse, which may be engaged in one direction or both simultaneously. Operation is at 120-in. per min., irrespective of feeds or table speeds. Sixteen feeds are provided for both the rail head and the side head. These feeds range from 0.004 to 0.750 in. per revolution of the table. Both heads are fitted with large micrometer dials, as well as graduated scales and observation stops. Feed and rapid traverse for one head are entirely independent of those for the other.

Feed units are of the selective, sliding-gear type, with gears of heat-treated alloy steel controlled by pull pins with safety interlocks. The table-speed change gearbox is assembled as a separate unit in the bed and provides twelve speed changes ranging from 3.2 to 70 r.p.m.

The spindle is of semi-steel, ground and lapped to a running fit in bearings, with removable bronze bushings both top and bottom. Spiral bevel gears drive the table to assure fine finish without chatter or gear marks. Motion to the table is engaged by a multiple-disk clutch, in which is incorporated a cone brake. Centralization and grouping of controls on the side head saves steps and bending to reach controls.

The boring mill is designed so that additional features may be furnished. These include thread cutting attach-



Feeds from 0.004 to 0.750 in. per table revolution and table speeds from 3.2 to 70 r.p.m. are available on the Niles 42 to 50-In. Side-Head Boring Mill

ments for either the vertical head or the side head, a taper or forming attachment for the side head, and a complete cutting fluid attachment, comprising a tank, pumps, piping and suitable guards, by means of which the coolant can be controlled.

Shell Pickling Acid

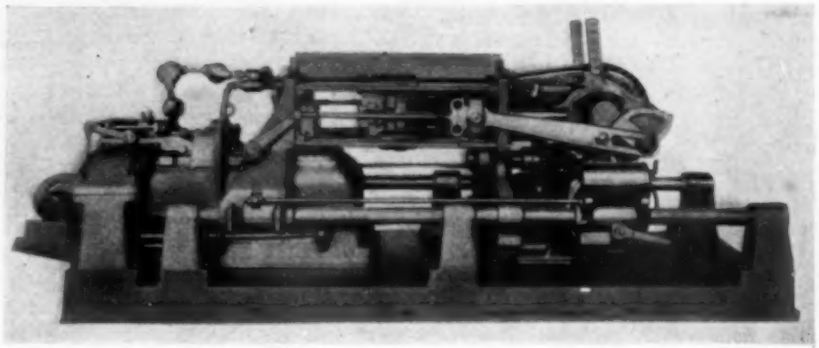
An acid pickling solution in concentrated form is being marketed by the Shell Petroleum Corporation, St. Louis, Mo. It has a sulphuric acid content of 73 to 75 per cent, approximately equivalent to 60 deg. Beaumé acid. Because of the inhibitor present, Shell pickling acid attacks only the scale without the liberation of hydrogen. Once the scale or rust is removed the action is stopped.

Ordinarily, for every pound of 60-deg. Beaumé acid used in excess of the amount required to remove the scale, 0.4422 lb. of steel is dissolved. The saving effected by Shell pickling acid will range as high as 10 to 15 lb. of steel per ton of steel pickled, plus a saving of 20 to 30 lb. of acid. As there is no action of the acid on the virgin steel, the surface is left clean, smooth, and free from pits. This condition is particularly desirable for galvanizing and enameling in later operations. There is no danger of over-pickling even with steels of high carbon content. Any danger of hydrogen absorption and brittleness is prevented by eliminating the formation of hydrogen.

The best temperature for pickling with Shell pickling acid is between 170 and 190 deg. F. The temperature may be raised to 210 deg. F., but no further economy is thereby developed. Heat is conserved by the blanket of foam, which also retains the steam. No fumes of sulphuric acid are given off, which means a saving up to 5 per cent in acid, besides saving in repairs on the building, cranes and other equipment. The throat, eyes and nose of the worker are not irritated, nor do their teeth become blackened.

When using Shell acid, it is practical to add a large amount to the tank, testing at intervals to determine the acid strength. A tank may be run down in acid strength to ½ per cent before it is discarded.

Shell pickling acid is shipped in tank cars or in 50-gal. steel drums.



Madison-Kipp 12 x 16-Inch Die-Casting Machine

Larger die-castings and a larger range of work can be performed on the 12x16-in. die-casting machine developed by the Madison-Kipp Corporation, Madison, Wis. For example, the frames of typewriters can be cast on this unit.

The melting pot is heated by 10 gas burners, five on each side. The waste heat is led up through two hollow castings and impinged on the goose-neck. In this way, solidification of metal in the goose-neck is prevented.

The rating of 12x16 in. is derived from the fact that the center distances between the four guide rods which carry the die carriage are 16 in. between the horizontal pairs of rods, and 12 in. between the vertical pairs. The stroke of the machine is 12 in.

Sixteen bolt holes are provided on the carriage for mounting the movable die member. To take care of cases where the standard hole locations are not suitable, a steel bolster plate has been provided on the front of the carriage.

Stationary dies up to 4½ in. may be mounted on the hot plate. When more space is required, it can be gained by inclining the parting line of the die, and having the gate run up to the cavity at an incline from the hot plate. Sixteen bolt holes are provided in the hot plate for the fixed die member. The movable die carriage is backed up by a heavy steel crosshead and a plate support ties the front end of the gearbox to the main base rails.

All important bearings are bronze bushed and lubricated from a Madison-Kipp lubricator. Where multiple die cavities are operated at high speeds on long runs, the dies may also be lubricated automatically. Complete automatic control of the mechanism is another feature. Back of the camshaft mechanism, which actuates the connecting rods from the main driving shaft to the carriage, there is a second pair of cams that give oscillation to the two vertical levers extending from the gearbox. These levers, in turn, operate bell cranks that advance and pull the cores at the correct point in the cycle. This mechanism must be designed and built for the particular die on which it is used. A safety device prevents metal from being forced into the die if the machine should be started accidentally in the reverse direction.

Control of the machine is through a single lever, which engages a clutch. Power is furnished by a 3-hp., four-speed, constant-torque motor. With the four motor speeds, provision is made for making, 2.77, 4.16, 5.55, and 8.33 shots per minute.

"DuLux" Finishes

Entirely different from Duco and designed for different applications and service conditions, DuLux finishing materials are suitable for both exterior and interior applications. They are manufactured by E. I. duPont de Nemours & Company, Inc., Philadelphia, Pa. For enamelling DuLux gum vehicle is used, while DuLux oil vehicle is employed

for painting. They are distinct chemical compounds. These DuLux vehicles are not varnishes and have no relationship to them. DuLux oil vehicle dries faster than natural oils, and on actual exposure without pigment has shown great durability. The gum vehicle shows greater retention of flexibility than ordinary enamel vehicles.

Finishes based on DuLux oil can be used on wood or metal buildings, structural steel, freight cars, and metal products. Finishes based on DuLux gum are for use where durability must be combined with faster drying (10 to 20 min. dust free) and greater hardness, and where finishes of enamel-like apearance are desired, such as on metal goods and machinery. It does not chip or crack.

DuLux finishes are resistant to gases, fumes, brine, and other deteriorating agencies. They are easily cleaned and are resistant to the action of soap and washing compounds. A full range of colors is available.

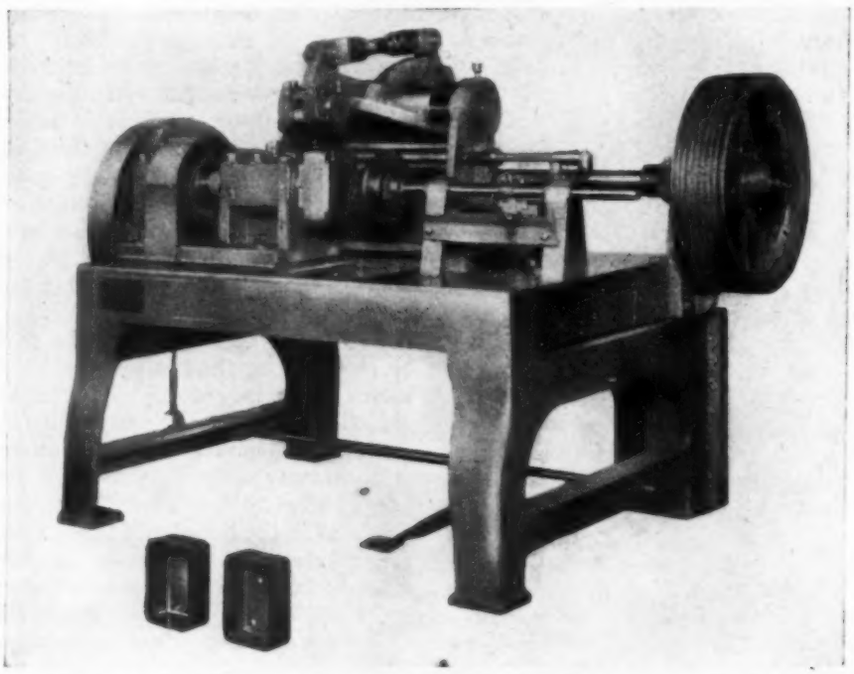
When used in a spray gun, DuLux atomizes freely, but still has enough body to adhere to vertical surfaces without sagging, breaking, or running. It is also practical for brush application. Dipping and roller coating may also be employed.

Bliss Automatic Trimming Machine for Boxes

Trimming of symmetrical boxes or containers made from brass or mild steel can be done on the automatic trimming machine developed by E. W. Bliss Company, 53rd St. and 2nd Ave., Brooklyn, N. Y. In the accompanying illustration there are shown boxes measuring 6 in. wide by 10 in. long, one of which has been trimmed. Stock up to $\frac{3}{32}$ in. thick can be trimmed and the machine will handle shells 20 in. across the corners and up to 6 in. in depth. The minimum size of shells handled is $4\frac{1}{2}$ in. wide by 1 in. deep. The ratio between width and length of shell cannot exceed 2 to 1.

This trimming machine is arranged with a Bliss positive rolling key clutch, and the gearing is such that the shaft actuating the trimming cam rotates once while the chuck spindle rotates one and one-half times. For this reason, it is necessary that the shells or boxes to be trimmed be symmetrical, as the starting point is the same every other time the shell is being trimmed. The upper cutter is mounted on a rocker arm and runs in roller bearings. The rocker arm is operated by a follow cam which conforms to the contour of the article to be trimmed. A separate cam is required for each shape. End thrust bearings on the rocker arm shaft maintain clearance between the upper and lower cutters.

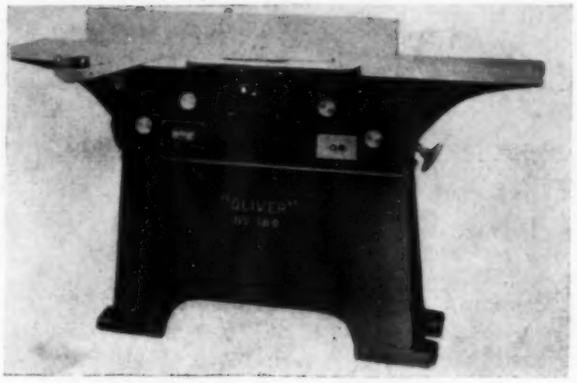
The operation of the machine is as follows: An untrimmed shell is placed on the chuck and is locked in position by means of the tail spindle; the clutch is tripped, and the machine trims the shell and also cuts the scrap in two pieces. The scrap falls through the opening in the bed. The operator next releases the trimmed piece by unlocking the tail spindle and bringing it to its extreme back position, thereby engaging a rod connected through levers with a knockout rod running through the chuck spindle. The trimmed box falls through an opening in the bed of the machine and can be removed or conveyed away by means of a belt or chute. The knockout rod is returned automatically to position by a compression spring. One $7\frac{1}{2}$-hp., variable-speed motor, running at 900 to 1,800 r.p.m., provides power for the machine, which turns over at 20 to 40 r.p.m. and trims 5 to 10 shells per min.



Bliss Automatic Trimming Machine for symmetrical boxes or containers of brass or mild steel from $4\frac{1}{2}$ in. wide x 1 in. deep to 6 in. wide x 20 in. across the corners

Oliver No. 189 Ball-Bearing Hand Planers and Jointers

Inclined bed jointers are now built in 6-, 8- and 12-in. sizes by the Oliver Machinery Company, Grand Rapids, Mich. These jointers will handle work up to the full rated capacity either with the fence square or tilted to 45 deg. Cuts up to $\frac{3}{4}$ in. thick can be made, and stock of almost any length can be jointed. Long tables are one of the features of these machines, being 60 in. long by $9\frac{1}{2}$ in. wide for the 8-in. jointer, and 72 in. long by 13 in. wide for the 12-in. jointer. They have a screw for vertical adjustment and gibbed dovetailed lock with hand knobs at the front. Both tables at the cutterhead are fitted with the removable steel



Oliver No. 189 8-In. Hand Planer and Jointer

angle throat pieces making the throat opening the narrowest possible.

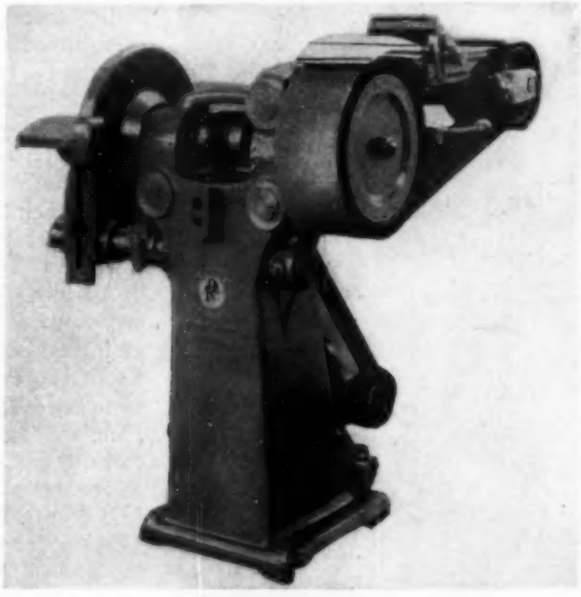
The cylinder cutterhead has a $3\frac{7}{8}$ in. cutting diameter for the 8-in. jointer and 5-in. cutting diameter for the 12-in. jointer, each fitted with three high-speed-steel knives. A one-piece cylinder yoke fitted with two ball bearings carries the cutterhead and shaft, on the outer end of which is mounted the rotor of the motor. Yokes, like other parts of the jointer, are interchangeable.

"Production" Type D Belt Polishing Machine

Work ordinarily polished against a buffing wheel can be polished on the type D belt finishing machine announced by the Production Machine Company, Greenfield, Mass. By the use of a belt running over the wheel, it is possible to cut better and produce a superior finish. Cost of abrasive is also reduced and the necessity of carrying a large stock of wheels is eliminated.

The cushion wheel is made up of a cast-iron hub supporting two steel flanges fitted with approximately 225 leather blades attached to metal holding pieces, which separate the leather sections from each other and also prevent radial bending of the leathers under operating speed. A cloth abrasive belt passes over this wheel and over a 12-in. idler pulley, this belt being the finishing member. It is kept in tension by means of a weighted swinging arm. The abrasive belt runs at 5,340 ft. per min., and under this speed the tension of the belt will slightly curve the leather blades. This bending is increased by the pressure of the work being finished, causing the abrasive belt to be supported at the point of finishing by the corners of the leather blades, while immediately adjoining these supporting points and within the thickness of the blades the abrasive belt is unsupported. In fact, it curves in places through the action of the pressure of the work. This curving results in a receptacle for the chips generated and provides for the free passage of the chips. A saw tooth effect is thus produced, giving high points for cutting and low points for chip recess.

Specifications of the type D machine are as follows: Cushion wheel, 17 in. diameter, 6 in. face; power required, for double machine, 5 hp., for single machine, 3 hp.; floor space required, 39 in. x 4 ft. 6 in.; abrasive belt, 6 in. wide x 9 ft. 10 in. long.



Fast cutting is assured at belt speeds of 5,340 ft. per min. on the "Production" Type D Belt Polishing Machine

Zeh & Hahnemann No. 30 Percussion Power Press

Unusual massiveness in the Zeh & Hahnemann No. 30 percussion power press is evident from the illustration. This press weighs 85 tons and is of the 4-pillar, built-up type. The 16-in. main screw is of tool steel, heat-treated. Over-all height of the press is 22 ft., and it requires 75 hp. for operation. The press is built by the Zeh & Hahnemann Company, 182 Vanderpool St., Newark, N. J.

The 120-in. flywheel is a steel casting and weighs 4 tons. All the

Weight of 85 tons, flywheel energy of 100,000 ft.-lb., height of 22 ft., and a 16-in. main screw illustrate the size of this Zeh & Hahnemann No. 30 Percussion Power Press

energy of the flywheel is utilized as it comes to a dead stop. Its energy amounts to 100,000 ft.-lb. This press is rated to yield 900 tons pressure normally.

An easily operated pneumatic control is fitted to the press. It reverses the slide automatically at the end of the down stroke and stops it at the up position. The stroke is 25 in., and the press operates at 10 strokes per min., if the full stroke is utilized.

An emergency brake is provided to stop the flywheel in case the empty

press is tripped. At the up stroke the flywheel is stopped promptly by means of a pneumatically controlled brake and is held in neutral position.

Since the flywheel travels at a peripheral speed of 26 miles per hour, the coefficient of friction is low, and the press would hesitate or even refuse to go up when soft blows are struck. Under such conditions, particularly on hot pressing, a slow speed pick-up is provided to overcome this difficulty. Both slide and bottom knockouts are provided to eject the finished pieces from the dies.

Clark "Stock Chaser"

A mechanical errand boy that is particularly suitable for large industrial plants has been placed on the market in the form of the "Stock Chaser" by the Clark Trucktractor Company, Battle Creek, Mich. The equipment consists of a sturdy 3-wheeled, gas-propelled tractor, equipped at the rear with a steel platform box 33½ in. wide by 29½ in. long and having a load capacity of 500 lb. This agile equipment (its turning radius is only 51 in.) is valuable for taking tools, jigs, and fixtures from the toolroom to machines, picking up special parts from storage, and carrying mail, shop orders, job tickets, and requisitions from one department to another.

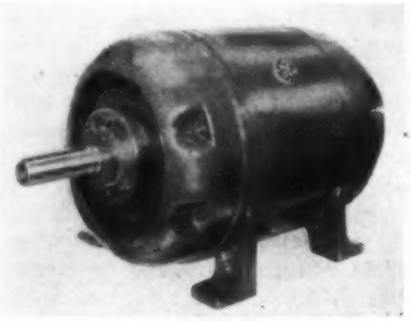
The rear platform is removable in two minutes, after which the equipment may be converted into a factory tractor with a standard trailer coupler, capable of hauling 25 tons on trailers through narrow aisles and along crowded platforms.

Clark "Stock Chaser," which has a load capacity of 500 lb.

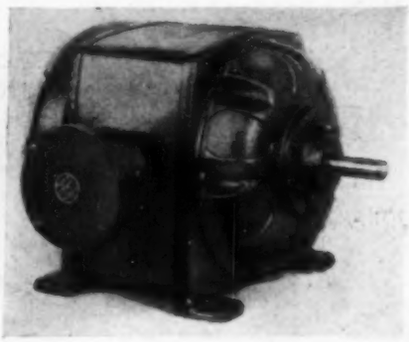
General Electric Motors for Hazardous Conditions

The General Electric Company, Schenectady, N. Y., has announced a line of totally inclosed, fan-cooled motors for the hazardous conditions specified as Class 1 in the National Electrical Code. The line conforms in most ratings to the mounting dimensions of open, general-purpose motors.

The polyphase induction motors comprise ratings from ¾ to 30 hp. in popular speeds, and are especially designed for us in explosive gas conditions classified as Class 1, Group D, such as are found in chemical plants and similar locations where the hazard involved is equal or less than that involved with high-test gasoline vapor-air mixtures. These motors are suitable for either outdoor or indoor operation and eliminate the necessity for fire walls and other arrangements now found necessary with the ordinary open or enclosed motor. Single-phase motors now built are rated from ½ to 2 hp., totally inclosed, for the same service, and fractional-horsepower ratings from ¼ to ½ hp., the latter either in repulsion induction or direct-current types.



Typical General Electric Polyphase Induction Motor of the totally inclosed, fan-cooled type for Class 1, Group D hazardous conditions

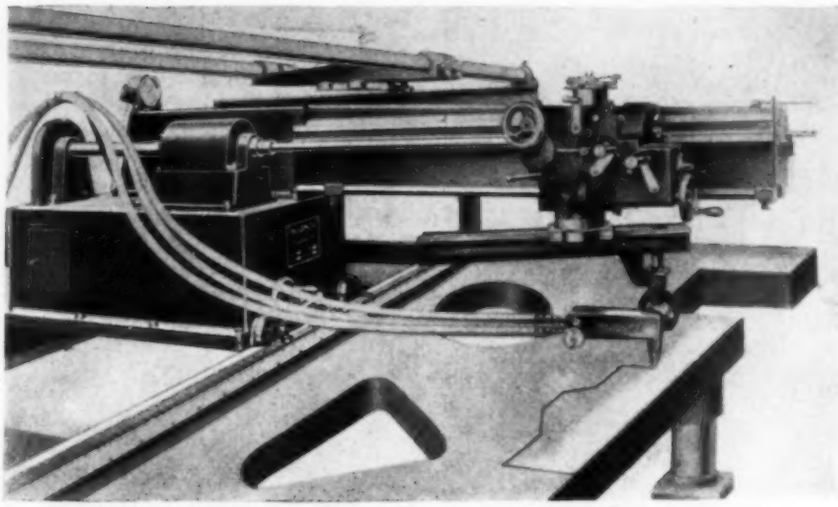


General Electric Single-Phase Motor of the totally inclosed type for hazardous service

"Messer" Oxyacetylene Shape Cutting Machine

Three sizes of the "Messer" automatic shape cutting machine have been introduced in the United States by Jos. C. Paulus & Company, 2507 Potter St., Philadelphia, Pa. These have cutting widths of 39, 58 and 78 in. respectively. Lengthwise cuts are limited only by the length of the rails upon which the machine is supported. Such machines have been built with rails up to 60 ft. long.

All parts of the machine not subject to wear are made of Silumin, an aluminum-silicon alloy. The machine itself is designed as a combination compound traversing-head and template cutting machine, and is able to execute practically any form of cut. It contains an inclosed motor of ¼ hp., direct connected to a stepless friction drive that is capable of moving the burner at any desired speed to suit the thickness of the material being cut. By means of a convenient handwheel, the speed may be adjusted.



"Messer" Automatic Oxyacetylene Shape Cutting Machine, which is available to cut 39, 58 and 78 in. widths, up to any length

It may also be read from a tachometer placed at the left of the machine.

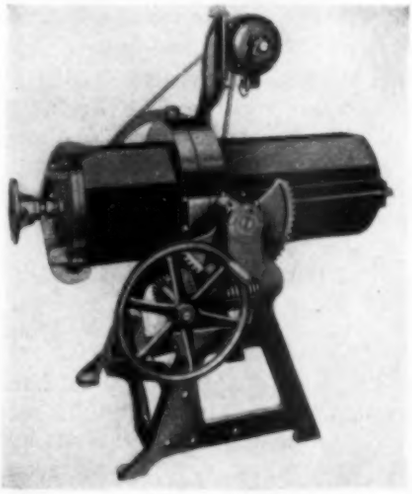
All control handles are so placed as to be within easy reach of the operator. Straight cutting of any right angle combination is effected by means of the traversing head, without the use of a template, and without interrupting the cut. Circular and arc-shaped cuts in combination with straight cuts are made by the use of the traversing head without the use of a template and without interrupting the cut. Bevel cuts can be made at any angle to the surface of the steel. Special cutting can also be done without a pattern.

Lasalco No. 2 Ball Burnisher

One of the principal features of the No. 2 ball burnisher recently developed by Lasalco, Inc., 2822 La-Salle St., St. Louis, Mo., is the fact that the barrel is supported near the center on a heavy roller bearing. This bearing carries practically the entire load of the barrel and contents when in the operating position and requires only a small amount of power because of the balanced condition.

The barrel is either gray iron or cast steel, at the option of the purchaser. It is an octagon casting $\frac{3}{8}$ in. in thickness, having a machined flange at the top to receive the cover end. It is lined either with 1-in. hard maple or welded steel. It also comes unlined. Another feature of the barrel is the cover, which is of cast steel and is attached to the barrel by means of three lever clamps, operated simultaneously by a center handwheel. On the under side of the cover there is a square groove which takes a $\frac{1}{2}$-in. square rubber-fabric packing, making a water-tight joint.

The drive is by a $\frac{3}{4}$-hp. motor mounted on a vertical standard. The motor is belted to a pulley which revolves the barrel through a bevel pinion and large ring gear. The gear is bolted to the roller bearing base on the barrel and can be easily replaced if necessary. The barrel revolves inside its supporting frame or yoke, which in turn is supported in trunnion-bearings at the top of the legs. By means of a worm gear device, the operator can tilt the burnisher to any position without effort, and it can be held in that position by the self-locking worm.



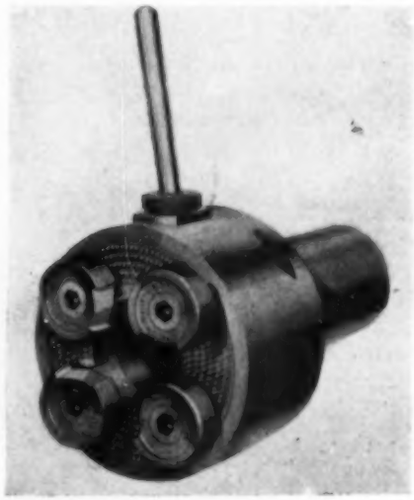
Lasalco No. 2 Ball Burnisher

The inside dimensions of the barrel are 42 in. long by 12 in. in diameter. The machine occupies a floor space of 48x57 in. and weighs 1,100 lb. with the motor.

"Namco" Style DS Stationary Diehead with Circular Chasers

For use on screw machines, turret lathes, and other machines with non-rotating die-holders, a style DS diehead has been announced by The National Acme Company, 170 E. 131st St., Cleveland, Ohio. The Style "DS" embodies all of the features of the style "DR" announced on p. 782, Vol. 72, of the *American Machinist*, and is supplementary to this model which is for use on machines with revolving spindles. It also has quick removable circular chasers that permit long runs between grinds, and allow at least ten times as many grinds per set of chasers. They are mounted on "quick removable" chaser blocks, the faces of which are ground to the exact helix angle of the thread. The style DS and style DR chaser blocks and chasers are interchangeable for the corresponding die sizes. Furthermore, any one chaser of a set may be replaced without the necessity of replacing the entire set.

Chasers are located by serrated steel buttons, and each is held to its block by a hollow-head screw. Close-



to-shoulder threading is made safe by the positive action of the die in opening. There are only four major parts—cup, body, adjusting plate and shank. All parts are of special hardened steel. The style DS diehead is built in $\frac{3}{8}$-, $\frac{9}{16}$-, $\frac{13}{16}$-, 1-, $1\frac{5}{8}$-, $2\frac{3}{8}$-, and $3\frac{3}{4}$-in. sizes.

EQUIPMENT ADAPTATIONS

RECENTLY DEVELOPED BY THE MAKERS

Rockford Improved Production Drilling and Boring Machines

Adaptability to give high production on several similar parts is featured in the line of heavy-duty, production-type, drilling and boring machines built by the Rockford Drilling Machine Company, Division of Borg-Warner Corporation, Rockford, Ill. Single- and double-end, three-way and four-way horizontal arrangements are available, as well as vertical machines and combinations of vertical and horizontal units. Various table arrangements are also available such as stationary, round indexing, indexing-drum type, cross-sliding, and others.

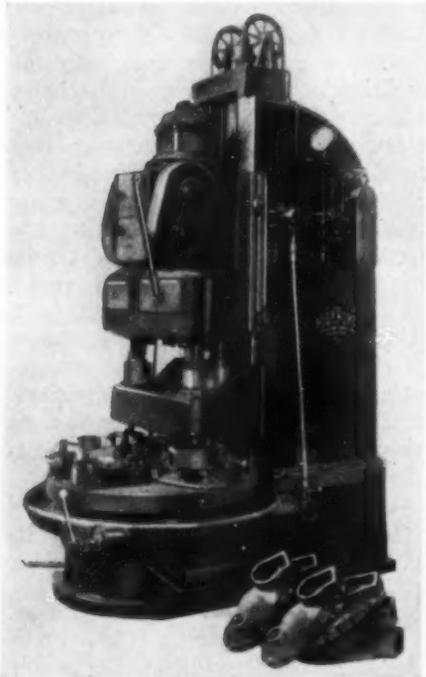


Fig. 2—Machine with three-station indexing table

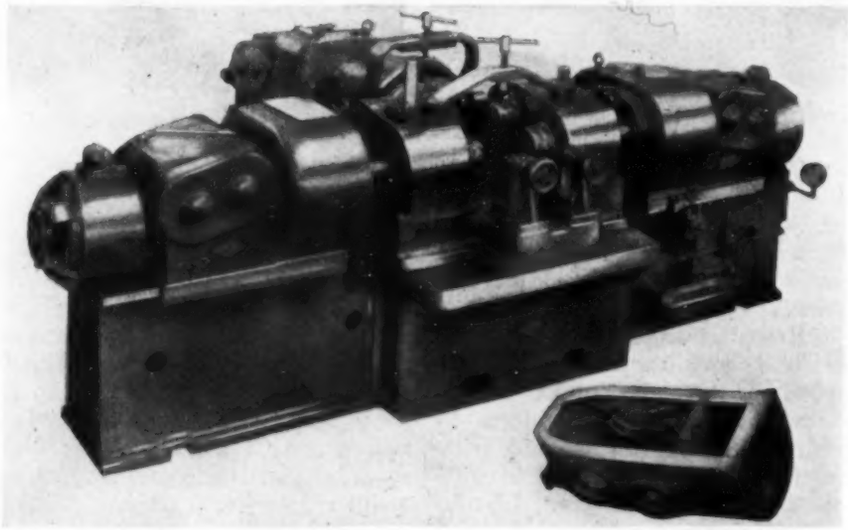


Fig. 3—Boring a massive tractor transmission case is done on this unit with a three-way horizontal arrangement of heads

Fig. 1 illustrates a double-end horizontal machine with a fixture for core drilling crankshaft and camshaft line bearings in automotive crankcases. Two extra spindle-units will be noted beside the machine. With the machine set up as shown, one type of crankcase is coredrilled on a high production basis. By replacing the spindle-units on the machine with the extra spindle-units on the floor, and also changing the fixtures, the machine is adapted to core drill another type of crankcase. This interchangeable spindle-unit feature can also be taken advantage of for the manufacture of different type motors, or when changes in a motor make necessary a different spindle arrangement.

Fig. 2 illustrates a vertical arrangement having a three-station indexing table for progressive operations on a large tractor gearcase housing. Unloading and loading takes place at the first station, while at the second station the hub is bored, rough turned, faced, and counterbored, and finally, at the third station the hub is finish bored and turned. In addition, the large hole at the other end of the case is rough and finish bored.

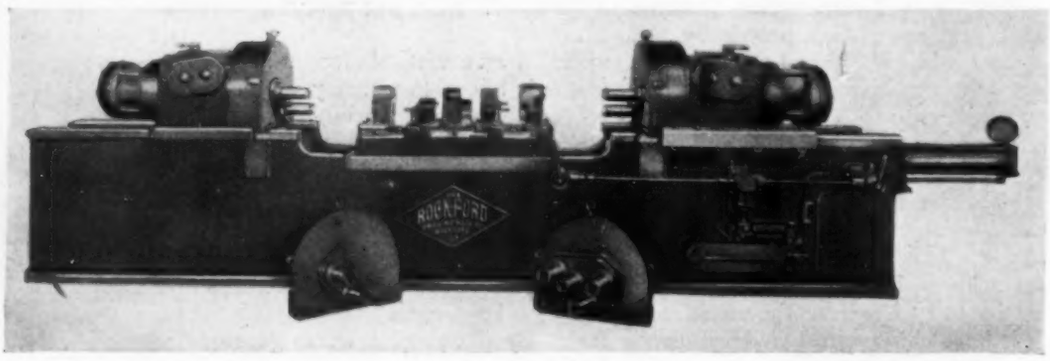


Fig. 1—Machine for core drilling crankshaft and camshaft line bearings in automotive crankcases

Fig. 3 shows a heavy-duty, three-way, horizontal arrangement for boring a massive tractor transmission case. This machine rough and finish bores the two cross holes on each side of the case, one of which is 7½ in. in diameter and the other 9 in., while the third part of the machine rough and finish bores the large end hole, which is 13⅞ in. in diameter. All holes are bored simultaneously and both rough and finish boring operations are done in one pass of the machine heads.

Interchangeable spindle-units are built up with the proper number of spindles on correct centers to suit the job. When applied to machines, these heads become practically an integral part thereof. The main driver of the spindle-unit connects with the main drive spindle of the drive head proper. Location is secured through hardened dowels and bushings. Where centers permit, all spindles are mounted in Timken taper roller bearings, or where more space is available, in ball bearings. Feed is secured through an Oilgear pump driven by a separate motor. Special arrangements of the Oilgear control permit full automatic operation cycles.

Fig. 2—Spindle set-up for grinding pool balls

Grinding Spherical Work by the Centerless Method

Finishing spherical work by the centerless method has been announced by the Cincinnati Grinders Incorporated, Cincinnati, Ohio. The fundamental principles which apply to all centerless grinding operations are employed, although the regulating or feed wheel is arranged differently than in the usual procedure. As shown in Fig. 1, the grinding and regulating wheels are both trued radially for ball grinding. In order to generate a true sphere on each ball, the regulating wheel is mounted on a special collet at an angle of 12 deg. to the axis of the regulating wheel spindle. This produces a constantly varying inclination of the regulating wheel relative to the grinding wheel axis as the regulating wheel spindle revolves. Thus far, balls of hardened steel, cast iron, Monel metal, glass, casein, hard rubber, and Bakelite have been ground by the centerless method. The range of work finished includes pieces from ¼ up to 4 in. in diameter.

Centerless grinding of balls affords extreme accuracy, high finish, and uniform roundness. Limits for roundness are consistently held within 0.0002 in.

Fig. 2 shows the spindle set-ups for grinding casein pool balls. The ball is placed on the work support blade in the grooved portion of the grinding wheel. Fig. 3 shows the arrangement for grinding 1-in. hardened steel balls on a No. 2 Cincinnati centerless grinder. The work is placed on two fingers of the hydraulic loading attachment. Slight movement of the hand in-feed lever shifts the hydraulic valve, thereby lowering the work onto the work rest blade between the grooved grinding wheel and the regulating wheel. By continuing the movement of the hand in-feed lever, the in-feed slide moves toward the grinding wheel.

After grinding, the hand lever is returned to the starting position, the regulating wheel backs away, the hydraulic valve is reversed, and the finished work is lifted from between the wheels to the original position. On this particular arrangement, the work is manually loaded and unloaded, but all other operations are automatic. These balls are ground in two cuts, the total stock removal being 0.008 to 0.010 in. Production of ten pieces per minute per cut is obtained. Limits are ± 0.0005 in.

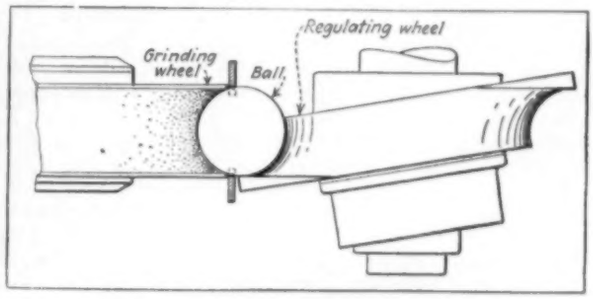


Fig. 1—Arrangement of grinding and regulating wheels for spherical grinding

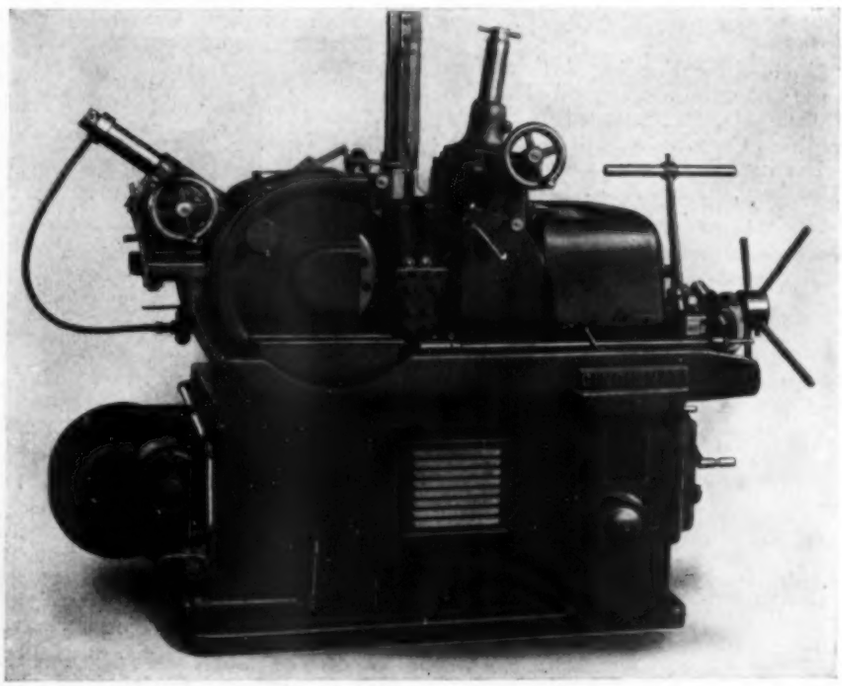


Fig. 3—Cincinnati No. 2 Centerless Grinder set up for 1-in. hardened steel balls

PATENTS

OCTOBER 28, 1930

Metal-Working Machinery

Machine For Working Metal Rods, Bars, and the Like. Jacob Test Leech, Beaver, Pa., assigned to Union Drawn Steel Co. *Patent 1,779,479.*

Core-Making Apparatus. James R. McWane, Birmingham, Ala., assigned to McWane Cast Iron Pipe Co. *Patent 1,779,485.*

Way-Guard Construction for Machine Tools. John J. N. Van Hamersveld, Cleveland Heights, Ohio, assigned to the Warner & Swasey Co. *Patent 1,779,520.*

Cross-Slide Carriage for Machine Tools. Julius L. Bayer, Cleveland, Ohio, assigned to the Warner & Swasey Co. *Patent 1,779,527.*

Automatic Machine. John P. Brophy, Cleveland, Ohio, assigned to the Cleveland Automatic Machine Co. *Patent 1,779,529.*

Centerless Grinding Machine. James A. Phelps, Cleveland, Ohio. *Patent 1,779,618.*

Automatic Grinding Machine. Charles H. Norton, Plainville, Conn., assigned to Norton Co. *Patent 1,779,779.*

Automatic Cylindrical Grinding Machine. Charles H. Norton, assigned to Norton Co. *Patent 1,779,823.*

Sheet-Metal-Edging Machine. Wilber R. Magee, Ann Arbor, Mich. *Patent 1,779,874.*

Machine for Developing or Generating Mitered Ends of Cylinders. Fred C. Fantz, Webster Groves, Mo., assigned to Midwest Piping & Supply Co. *Patent 1,780,009.*

Machine for Forming Articles from Sheet Materials. Bernard M. Fine, Philadelphia, Pa., assigned to Sanitary Products Corporation. *Patent 1,780,01..*

Drilling Machine. Edward Joslin Kinksbury, Keene, N. H., *Patent 1,780,083.*

Tools and Attachments

Core-Bar Gage. Ira Langston, Birmingham, Ala., assigned to McWane Cast Iron Pipe Co. *Patent 1,779,477.*

Feeder for Punching Machines. George O. Rockwood, Indianapolis, Ind., assigned to Rockwood Manufacturing Co. *Patent 1,779,641.*

Rotary Work Support. Albert M. Johnson, Rockford, Ill., assigned to Barnes Drill Co. *Patent 1,779,674.*

Adjustable Bearing for Spindles. Frank Eatock, Bolton, England. *Patent 1,779,781.*

Feeler for Sizing. Sol Einstein, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. *Patent 1,779,807.*

Feeler Gage. James E. Hastings, Athol, Mass. *Patent 1,779,812.*

Feed Mechanism. Richard Lester Wilcox, Waterbury, Conn., assigned to the Waterbury Farrel Foundry & Machine Co. *Patent 1,779,886.*

Feed Device for Can-Body-Forming Machines. Mervyn B. Troyer, Seattle, Wash., assigned to Seattle Astoria Iron Works. *Patent 1,780,049.*

Furnaces

Metal-Heating Furnace. Richard Kaier, Cranford, N. J., assigned to the Singer Manufacturing Co. *Patent 1,779,435.*

Combustion Control. Gordon Simmons, Baltimore, Md. *Patent 1,779,513.*

Method of Apparatus for Heat Treating Magnetizable Metals. Horace C. Knerr, Philadelphia, Pa. *Patent 1,779,-604.*

Furnace for and Process of Heating Articles. Henry A. Dreffein, Chicago, Ill., assigned to Flinn & Dreffein Co. *Patent 1,779,964.*

Processes

Processes of Grinding. Sol Einstein, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. *Patent 1,779,467.*

Method of Making Wheels. Lloyd D. Kay, Los Angeles, Calif., assigned to Kay Brunner Steel Products Incorporated. *Patent 1,779,476.*

Method of Working Metal Rods, Bars and the Like. Jacob Test Leech, Beaver, Pa., assigned to Union Drawn Steel Co. *Patent 1,779,478.*

Process of Welding. Claude Theodore Siebs, Riverside, and Thomas Archie Daniel, Maywood, Ill., assigned to Western Electric Co. *Patent 1,779,563.*

Method of Forming Metal Bodies. Roy A. Lewis and John M. Sylvester, Bethlehem, Pa., assigned to Bethlehem Steel Co. *Patent 1,779,607.*

Apparatus for and Method of Forming Castings. Haskel C. Carter and Harry E. Spieth, Portland, Ore., assigned to Iron Fireman Manufacturing Co. *Patent 1,779,763.*

TRADE PUBLICATIONS

CLEANING METAL. The Magnus Chemical Co., Garwood, N. J., has issued a booklet entitled "The Cleaning of Metal" on processes, methods, and materials with practical suggestions for their use. Many cuts and diagrams are scattered through the 76 9x6-in. pages.

CRANES. The Whiting Corporation, Harvey, Ill. (Chicago Suburb), has published a handbook on "Crane Engineering," which contains both technical and practical information of value to executives and engineers. It contains 18 illustrated sections of design information, drawings and specifications.

DIEHEADS. The Landis Machine Co., Inc., Waynesboro, Pa., has issued Bulletin No. C-63 on stationary pipe, casing, drill pipe, line pipe and tubing dieheads for pipe threading and cutting machines. They can also be applied to other makes of pipe machines. Briggs Standard pipe threads, or long-length threads on casing and drill pipe can be cut.

FORMING MACHINES. The Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y., has issued an illustrated 8-page folder on slip roll formers for sheet metal.

MOTORS. The Reliance Electric & Engineering Co., Ivanhoe Road, Cleveland, Ohio, has issued Bulletin No. 109, as of September 1930, on Type AA induction motors with ball bearings for two- and three-phase a.c. circuits.

OVENS, CONVEYOR-TYPE. The Despatch Oven Co., 622 Ninth St., S. E., Minneapolis, Minn., has issued Bulletin No. 11 on "Despatch Conveyor Ovens," featuring elevator and tunnel types for various baking and drying processes.

PLATING. The Crown Rheostat & Supply Co., Chicago, has published a catalog on plating and polishing operations, being a comprehensive, sectionalized treatise on the operation of modern plating and polishing departments.

PLATING BARRELS. The Hanson-VanWinkle-Munning Co., Matawan, N. J., has issued bulletin No. M-104 on "Hanson-Munning" plating barrels of the Mercil type. Constructional features of these barrels are discussed and many installation views are presented.

PRESSES. The Waterbury Farrel Foundry & Machine Co., Waterbury, Conn., has issued a general catalog including data on single and double-acting crank presses; cam presses; multiple plunger presses; knuckle joint or toggle presses; foot and screw presses; shearing presses and slitters; press attachments; and lathes for shells, including thread rolling machines. Each item is very finely illustrated, and the applications and specifications are listed. The catalog contains 303 9x6-in. pages bound in imitation leather.

PROJECTION WELDING. The American Electric Fusion Corporation, 2610 Diversey Ave., Chicago, Ill., has issued Bulletin No. 60 in color on the possibilities of multiple welding by the use of stamped projections in the piece. The company's new Type C-D welding machine is also illustrated and the principle of operation explained.

ROLLER BEARING UNITS. The Shafer Bearing Corporation, 6501 West Grand Ave., Chicago, Ill., has issued catalog No. 10 illustrating and describing stock mountings of Shafer roller bearings. The range in types and sizes has recently been increased. The units include hanger boxes, pillow blocks, duplex units, cartridge units, a flange mounting, take-up bearings, and conveyor rolls.

NEWS OF THE WEEK

Metal-Working Machinery Exports Show Slight September Decline

WASHINGTON, D. C., Nov. 4—Exports of machinery showed no material decline in September, as compared with August. The value of all exports of machinery in September was $52,283,939. This is a decline of more than $40,000,000 from the value of exports in September, 1929. Figures showing the major sub-divisions of the export movement in machinery are:

	August 1930	September 1929	September 1930
Electrical machinery and apparatus	$8,873,466	$11,312,997	$8,717,767
Industrial machinery	15,613,558	22,579,493	15,944,475
Construction machinery	1,290,416	2,230,372	1,580,773
Mining and pumping machinery	3,327,759	4,523,240	3,406,082
Power-driven metal-working machinery	2,193,113	2,789,871	2,239,515
Other metal-working machinery	490,664	592,850	574,222
Textile machinery	690,900	1,034,726	649,231
Sewing machines	445,936	951,331	432,002
Other industrial machinery	5,601,334	7,775,095	5,653,809

These figures of the Commerce Department show a slight decrease in exports of electrical machinery in September, as compared with August, a slight increase in exports of industrial machinery, a material increase in construction machinery, a slight increase in mining machinery, a slight increase in power-driven metal-working machinery, a sharp upturn in other metal-working machinery, a small decline in textile machinery, a very small decline in sewing machines, and a slight increase in other industrial machinery.

The detailed figures for power-driven metal-working machinery showing exports in September, 1930, as compared with September, 1929, are:

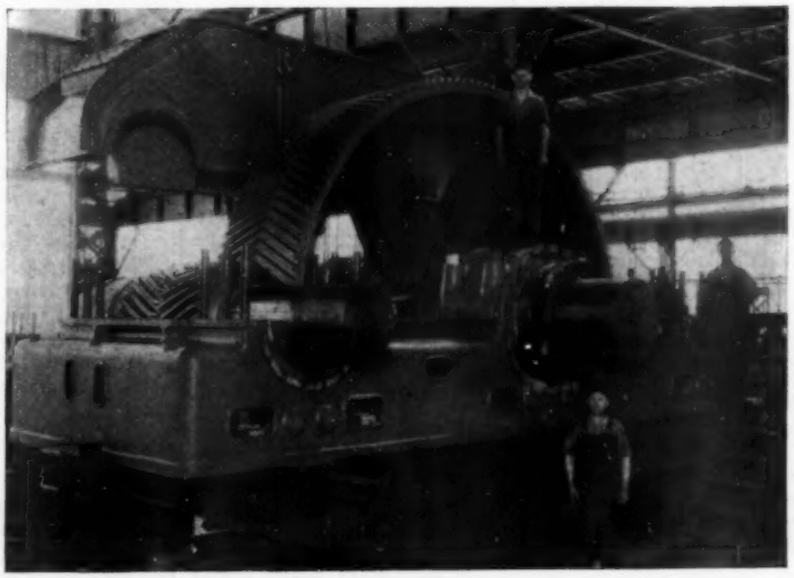
	September 1929	September 1930
Engine lathes	$195,961	$95,222
Turret lathes	140,537	22,718
Other lathes	198,387	81,486
Vertical boring mills and chucking machines	19,974	16,140
Thread-cutting and automatic screw machines	99,179	49,145
Knee and column type milling machines	141,800	58,754
Other milling machines	175,097	125,481
Gear-cutting machines	125,234	118,236
Vertical drilling machines	49,318	34,515
Radial drilling machines	21,798	.....
Other drilling machines	44,767	110,205
Planers and shapers	64,595	52,784
Surface grinding machines	20,913	.....
External cylindrical grinding machines	185,962	60,390
Internal grinding machines	100,482	35,005
Tool grinding, cutter-grinding and universal grinding machines	34,625	28,990
Other metal working-machines	94,608	107,286
Sheet and plate-metal working machines	272,330	231,123
Forging machinery	85,894	169,309
Rolling mill machinery	119,703	210,016
Foundry and molding equipment	190,114	239,839
Other power-driven metal-working machinery and parts	410,593	342,861

It will be noted that the increases were confined to forging machinery, rolling mill machinery, foundry and molding equipment, and to the unclassified grinding and drilling machines.

Detailed figures for other metal-working machinery are:

	September 1929	September 1930
Pneumatic portable tools	207,358	101,794
Other portable and hand or foot operated metal-working machines and parts	88,288	60,611
Chucks for machine tools	21,318	10,533
Drills and reamers	72,107	49,548
Pipe stocks, pipe dies and pipe cutters for thread cutting die stocks, screw plates, taps and dies	49,072	151,111
Other metal-working machine tools	86,526	155,022

Increases in the foregoing lists were confined to the unclassified thread-cutting dies and taps and dies and other metal-working machine tools, but in each instance the increase was quite material as compared with September of last year.



A one-piece, 81-ton, 139-tooth gear, and a 27-tooth, 48-in.-face pinion are included in this Falk totally enclosed, single-reducer gear unit. It will be used by the U. S. Aluminum Co. at Alcoa, Tenn., with two 3,000-hp. motors, reducing their speed of 90-180 r.p.m. to 17.5-35

Chinese Prefer American Automobiles

Registration of automobiles in China, according to the world census of registrations as of Jan. 1, 1930, show a total of 35,489, of which nearly 77 per cent are American makes, and which increased about 24 per cent over the number in operation on Jan. 1, 1929. Of the 22,912 passenger cars, 75 per cent are American; of the 6,410 buses and 6,167 trucks, the American share is 80 per cent. In addition, the number of motorcycles registered at the beginning of 1930 was 2,419, American makes accounting for 35 per cent. The American share of the trade there has risen from a little over half to more than 80 per cent in five years.

Acetylene Association To Hold Welding Program

The thirty-first annual convention of the International Acetylene Association will be held in the Congress Hotel, Chicago, on Nov. 12, 13, and 14, with the major portion of the program devoted to oxy-acetylene welding and cutting. One of the special sessions will be on the metalworking industry. Among the papers to be presented are: Production Welding by the Oxy-Acetylene Process (2 papers), Tube Turns, Welding and Cutting on Railroads, and Truck Transportation.

French Metal-Working Industry Awaits Signs of Change

BY OUR PARIS CORRESPONDENT

STILL with ears to ground, those responsible for French industrial and economic enterprise are awaiting echoes which shall enliven the business situation. From all sides it is heard that the depression has reached its acute stage. At the same time, prices in general are rising—with a few inexplicable exceptions.

Raw material prices are supposedly stabilized and in general are admittedly low. The labor wage is far from being in the same category, though no one has the temerity to suggest that it will go up or come down in the immediate future.

Depending upon what the consuming public will pay, manufacturer and worker alike will formulate future demands. Automobile prices are coming down. If profits are satisfactory, raw material costs and the payroll being what they are, improvement in the situation has avowedly been brought about by more advanced production methods and improved tool equipment.

The League of Nations "Tariff Holiday" agreement having been buried and Monsieur Briand's latest plan for an Economic European Union being adjourned for a year until the representatives of 27 nations can find sufficient excuse for killing it off, there need be little fear that a European campaign of an anti-American complexion will supervene.

The League Assembly delegates were more particularly concerned with the pretentions of the agricultural countries of Europe who would agree to buy manufactured goods, tool equipment, machinery, and what not of the other essentially manufacturing countries of Europe. The whole structure was of European purport, though by no means Pan-European.

Monsieur Albert Thomas, Director of the International Labor Office at Geneva, is quoted as having said recently that the influence of the United States in the metallurgical and metal-transforming industries has found its echo throughout the world. He refers to this as the basic unit upon which other industries are to be judged. He continued: "Resulting from this, the world has demanded that increased capital investment and equipment which has flowed abroad from the United States to revive so many somnolent industries in Europe." The appreciation should encourage other American manufacturers to go after their share of what is apparently waiting business.

French exports to foreign countries and to colonies and protectorates are falling off. It is the latter phase which most closely touches French industry.

During the last four months, imported products have seen their price index fall 50 points, from 497 to 446, whereas national products have risen 24 points. Minerals and metals, however, fell 15 points, which is naturally favorable to the transforming trades. Incidentally, the values of metallurgical and mechanical stocks and bonds have fallen 20 points from their status of a year ago. The situation is far better, however, than that of textiles, which has fallen 53 points.

French exports of manufactured products have actually dropped for the first six months of the year 20 per cent as compared with 1929, while manufactured products imported have increased 22 per cent. The deficit in imports of raw materials for industry is the weak point of the situation.

The growing agricultural machine industry is now being affected more seriously than ever before by American and German competition; more so in Algeria, Tunisia, and Morocco than in France. The industry has recognized, nevertheless, the beneficial effects of standardization and rationalization of production methods, which in France to date have been exceedingly backward. On a price basis, the French product is high on whatever market it is offered; that of Germany is low. The whole story is there.

The automobile industry is not optimistic. Difficulties lie largely on the selling side, due to general economic indisposition of the buying public. Any innovations likely to develop at the October Auto Salon are destined to show in the matter of price rather than on the score of novelty. The industry may be said to be marking time.

It is reported here that the Durant-Mathis combination is going after the German small car market. This must mean an increased demand for tool equipment either here at the French plant near Strasbourg or in the D.K.W. plant at Schoppau, which is supposed to be ear-marked for taking over by Mathis.

Railway rolling stock plants are to profit from orders amounting to half a billion francs from the Alsace-Lorraine railways during the next five years. The Northern Railway of France has also a program not far different. The International Railway Carriage Cartel just formed is to centralize and distribute export orders on the basis of 34 per cent to Belgian makers, 28.8 to Germany, 13 to France, 10.5 to Italy, 6.9 to Czechoslovakia, 2.9 to Hungary, 22 to Austria, and 0.7 per cent to Switzerland.

The government official employment bureau states that 810 offers of work in the machine trades found virtually no takers during the past month. This must be a record among the industrial nations of the world. At the same time automobile manufacturers in the Paris district were actually laying off workers, though this is considered as seasonal. Qualified machine tool operators are, on the other hand, being sought in the Paris district, while unskilled labor is not needed.

AT THE annual meeting of the American Society for Steel Treating in Chicago during the National Metal Congress recently, the New Jersey Chapter of the Society was awarded the "R. M. Bird bell and gavel" for its assistance to the national officers, its excellent organization, and its educational progressiveness. Pres. Robert G. Guthrie of the A.S.S.T. awarded the bell and gavel to the Chapter, now only a little more than a year old.

BUSINESS ITEMS

The Carrier Engineering Corporation, Newark, N. J., the Brunswick-Kroeschell Co., New Brunswick, N. J. and Chicago, Ill., and the York Heating & Ventilating Corporation, Philadelphia, are to be merged, according to a recent announcement. Assets of the consolidated company will amount to $15,000,000. Including subsidiaries, the merger will unite fifteen companies, five of which are foreign subsidiaries. All companies will retain their identity under a holding company to be known as the Carrier Corporation. The holding company will conduct all research and will direct sales and engineering activities for the group.

G. H. Bolle has been appointed New York representative of the Coppus Engineering Corporation, Worcester, Mass., with offices at 120 Liberty St.

The structural steel fabricating and tank and Gallagher pontoon deck manufacturing plant of the Consolidated Steel Corporation, Ltd., Los Angeles, now under construction at the intersection of Slauson & Eastern Aves., Maywood, Calif., will be in full operation by the end of the current year, according to present plans. Two buildings, the Gallagher pontoon deck unit, measuring 135x475 ft., and the erection equipment warehouse, 50x200 ft., have been completed. Work in various stages is under way on the other structures, which include the templet shop and power house, 75x275 ft.; the maintenance and rivet making building, 75x200 ft.; the blacksmith shop, 75x65 ft.; and the main structural shop, 222 ft. wide x 600 ft. long. With the exception of the office, all buildings will be of the industrial type, light structural frames covered

with corrugated sheet iron. General offices of the corporation will remain at 1200 No. Main St., and the operations of the foundry, machine shops, forging and plate shops and the crane, hoist, and elevator departments will continue at the site of the former Llewellyn Iron Works adjacent to the general offices, and at the remaining portion of the former Baker Iron Works on North Broadway.

The E. Dean Wilkes Co., 18 Toronto St., Toronto, Ont., has been appointed representative of the Omega Machine Co., Kansas City, Mo.

Beaver Piston Rings, Ltd., has been formed at Gananoque, Ont., and C. C. Skinner, formerly vice-president of the Skinner Co., Ltd., is president and general manager. The company will carry on operations in the plant formerly occupied by the Canada Cabinet Co.

The Toronto (Ont.) Industrial Commission has announced the formation of the Zanogen Steel Co. of Canada, Ltd., affiliated with W. Fearnehough, Ltd., Sheffield, England, maker of machine knives and shear blades. The new company has installed a machine shop and precision grinding plant, and will do finishing work on their parent company's products.

The Illinois Wire & Manufacturing Co., Joliet, Ill., is to locate its New England distributing plant in Waltham, Mass. Foundations have already been laid for a main building, 28x32 ft., and a storage building 28x36 ft.

The Luther Grinder Manufacturing Co., 285 E. Seeboth St., Milwaukee, is being reorganized as the Luther Grinder & Tool Co., formed with $100,000 capital stock by Ely Bockshe and others. The new Luther firm will manufacture grinding machinery, tools, and hardware specialties. Pending reorganization, the plant is being operated in a small way.

The Illinois Wire & Manufacturing Co., Joliet, Ill., will locate its New England distributing plant in Waltham, Mass., this plant supplying New England, sections of New York, and New Jersey.

The Atlas Heating & Ventilating Co., Oakland & San Francisco, Calif., gas heating equipment manufacturer, recently completed an enlargement of its Oakland plant at 32nd & Louise Sts., of 4,000 sq.ft. A. M. Green is general manager of the firm, and Al Miqueu superintendent of the Oakland plant.

The Massillon (Ohio) Bridge & Structural Co., and the Fort Pitt Bridge Co., Pittsburgh, has been consolidated under the name of the Fort Pitt Bridge Works Co. Theodore A. Straub is president of the new company, H. R. Blickle, vice-president, and P. B. Straub, secretary-treasurer.

The Adirondack Steel Foundries Corporation, Watervliet, N. Y., has opened a district sales office in Room 426, Park Square Bldg., Boston, in charge of W. W. Weller, New England sales manager.

Lincoln Electric

THE THINKER—Welding Version

The Fuller Lehigh Co., Fullerton, Pa., a Babcock & Wilcox organization, will occupy booth Nos. 54 and 55 at the forthcoming New York Power Show Dec. 1-6. The new Type B pulverizer and several other items of equipment will be included in the display.

The Morse Chain Co., Ithaca, N. Y., will demonstrate silent chain drives, flexible couplings, speed reducers, disk and ring oilers, and chain parts at the Power Show in New York City from Dec. 1-6. W. W. Bertram, manager of the New York office, will be in charge.

The Northwest Machinery Co., has been formed in Boise, Idaho, by four firms of general contractors, including the Triangle Construction Co., Spokane, Wash., the Quinn-Robbins Co., Ryberg, McCune & Cowley, and the Idaho Contracting Co., all of Boise.

The Rental Machinery Co., has opened at 120 Union Ave., N. Portland, Ore., with O. C. Thiel as manager. Present space is a 50x90 ft. brick building.

The R. J. Schwab Furnace & Manufacturing Co., 251 Reed St., Milwaukee, has moved to Cedar Grove, Wis., where it will occupy the enlarged works of the Cedar Grove Stove Co. The Milwaukee plant has been purchased by the Wisconsin Gear & Engineering Co., and the Howard Brass & Copper Manufacturing Co., both of Milwaukee.

The Plate-Lock Battery Manufacturing Co. Ltd., formerly at Sutton West, Ont., Canada, will establish a factory in Oshawa, Ont., located adjacent to the Westman Machinery Co. plant, also recently established there.

Dan E. Marshall has opened a jobbing and specialty shop in the Western Machinery Exchange Bldg., 1614 Santa Fe Ave., Los Angeles, Calif.

The American Engineering Co., will occupy spaces 70 and 71 at the Annual Power Show from Dec. 1 to 6, at the Grand Central Palace, New York, exhibiting various products. J. B. Copeland, New York office manager, is in charge of the exhibit.

The Palmer-Bee Co., Detroit, has opened the following district offices: Buffalo, Room 333, Ellicott Sq. Bldg., C. E. Jeremias, district manager; Pittsburgh, Room 508, Farmers Bank Bldg., 5th Ave. & Wood St., C. E. Musselman, district manager; Cleveland, Room 1056, Rockefeller Bldg., F. B. Barkwill, district manager; Southern District, Room 1210, Reynolds Bldg., Winston-Salem, N. C., E. S. Davidson, district manager; Philadelphia, Bulletin Bldg., S. T. Transeau, district manager.

The Wayne Machine Corporation, 938 Ft. Wayne Ave., Indianapolis, Ind., has been reorganized and is now operating under the name of the Wayne Machinery & Supply Co. at the same address.

Burton Griffiths & Co., Ltd., Birmingham, England, English sales agent for American machine tools manufactured by Landis, Kearney & Trecker, Gisholt, Lapointe, Blanchard, and other firms, have moved to Montgomery St., Sparkbrook, Birmingham. A. Andrews is managing director.

The Lakewood Engineering Co., Cleveland, a division of the Jaeger Machine Co., Columbus, Ohio, will move its plant to Columbus immediately, according to an announcement by O. C. Mandt, vice-president. A new factory is being built to house the equipment being moved.

Incorporation of the National Engineering & Equipment Co., Milwaukee, Ore., has been completed for the purpose of manufacturing a new precision tool-post grinder and other machines. H. S. Phillipson is manager of the new company, with H. E. Crane secretary, and E. W. Kirkpatrick treasurer.

The Chicago Pneumatic Tool Co., 6 E. 44th St., New York City, has erected a new service station at 570 East Larned St., Detroit, Mich. The building is reinforced concrete, faced with brick and trimmed in limestone. The building contains approximately 12,000 sq.ft. of floor space in its two stories and basement.

Transfer of control of the Chapman-Stein Co., a subsidiary of the C. J. Cooper-Bessemer Co., Mount Vernon, Ohio, to the Surface Combustion Co., Toledo, Ohio, a subsidiary of Henry L. Doherty & Co., New York, has been arranged, according to a recent announcement. The Chapman-Stein organization will be transferred to Toledo.

The Alloy Welding & Manufacturing Co. has been formed in Pittsburgh to take over the Pittsburgh Producers' Supply Co. The principal activity will continue to be the welding of corrosion- and heat-resistant steels. Officers are: Reeve H. Banks, president; Clifford J. Francis, vice-president; and W. L. James, secretary and treasurer.

The Link-Belt Co. has closed a contract for a powdered coal system for its Indianapolis foundry at a cost of $125,000. A building to house the system and alterations to the plant will be included.

The Elkhart (Ind.) Press Co., has increased its total capital stock from $85,000 to $150,000, and necessary reorganization papers have been filed. The first board of directors is composed of James E., Leonard E., and Maud Loshbrough.

The Harron, Rickard & McCone Co., 1600 Bryant St., San Francisco, has been appointed Northern California representative by the Porter-Cable Machine Co., Syracuse, N. Y.

The Samson-United Corporation, Rochester, N. Y., has opened a Chicago office in the Merchandise Mart, Suite 1491. Harry W. Fisher has been appointed manager.

The Spring City Foundry Co., Waukesha, Wis., is planning a one-story foundry addition.

PERSONALS

R. L. Agassiz, chairman of the board of the Calumet & Hecla Consolidated Copper Co., Boston, Mass., was re-elected president of the Copper & Brass Research Association at its tenth annual meeting in its offices at 25 Broadway, New York, on Oct. 23. Vice-presidents elected included S. S. Chase, Lewis S. Tates, H. Donn Keresey, and Thomas D'A. Brophy. Stephen Birch was re-elected treasurer, William A. Willis, manager, and Bertram B. Caddle, secretary.

Norman Berry, formerly manager of the Regina zone for General Motors Products of Canada, has been appointed sales promotion manager in Canada. For the past six years, he has held various executive posts in Western Canada.

E. S. Black has been appointed research engineer for the Pettibone-Milliken Co., Chicago. He was formerly in the sales department of the American Manganese Steel Co.

Alva Bradley has been elected a director of the American Shipbuilding Co., Cleveland, to fill the vacancy caused by the death of Hugh McBirney Johnston, Chicago. Other directors and officers were re-elected.

James C. Brady has been elected a director of the United States Pipe & Foundry Co., East Burlington, N. J., to fill the vacancy caused by the death of Nicholas F. Brady.

Georges Claude, famous French inventor, defended the practicability of his new process of obtaining power by utilizing the difference between the temperatures of water at the surface and at the lower depths of the sea, before an audience of engineers at a meeting of the Metropolitan Section, A.S.M.E., in the Engineering Societies Bldg. on Oct. 22.

Don R. Compton, Chicago, has been appointed assistant to the president and general manager of the Grigsby-Grunow Co., Chicago. Mr. Compton is the first incumbent of this office, created some time ago by the board of directors.

A. H. d'Arcambal, consulting metallurgist and sales manager of the Pratt & Whitney Co., Hartford, Conn., will present a paper entitled "Tool-Steel Tools" at a Cutting Metals session on Thursday, Dec. 4, during the A.S.M.E. annual meeting.

A. H. D. Altree, vice-president of the American Bosch Magneto Corporation, Springfield, Mass., has resigned effective Dec. 31, to retire from active business. Mr. Altree has spent 21 years with the company, 12 of them as vice-president.

J. T. Conners, district manager at Detroit for the Thew Shovel Co., Lorain, Ohio, for several years, is now in charge of field sales for the American Hoist & Derrick Co., St. Paul.

Martin H. Crego has been appointed manager of sales for the Phelps-Dodge Sales Co., Inc., New York, to succeed Charles A. Austin, resigned.

C. T. Crocker has been appointed designing engineer of the aeronautics and marine department of the General Electric Co., Schenectady, N. Y. Mr. Crocker first entered the employ of General Electric in 1900.

J. B. DeWolf, formerly assistant manager of the tin plate division of the Republic Steel Corporation, Youngstown, Ohio, has been appointed manager of sales of the Philadelphia district to succeed C. E. McKinley.

J. H. Higgins, metals engineer of the Camden (N. J.) Forge Co., addressed the Philadelphia Chapter of the American Society for Steel Treating on Friday, Oct. 24. He discussed the process of nitriding and its possibilities.

Van B. Hooper has been elected president of the newly organized General Grinder Corporation, Milwaukee, which will produce hand, power, and electric grinders, bench vises, and hardware. Charles G. Crabb is vice-president in charge of sales. Louis V. Shaw, secretary and treasurer, will be in charge of production.

A. K. Lewis, formerly works manager of Butler, Pa., of the American Rolling Mill Co., Middletown, Ohio, has returned to Middletown as assistant vice-president to succeed the late M. E. Danford. Harry Holiday, formerly general superintendent, will succeed Mr. Lewis.

Henry F. Arnold, superintendent of the American Tool & Machine Co., Hyde Park, Mass., is resigning, effective Dec. 31, after 63 years of service. He will continue as a director.

Dr. D. J. McAdam, Jr., formerly with the Naval Experiment Station, Washington, D. C., has been appointed chief of the metallography section of the Metallurgical Division, U. S. Bureau of Standards. The position had been vacant for a year.

G. E. Matthews of the Research Laboratory, Eastman Kodak Co., Rochester, N. Y., will discuss "Photography as Applied to Engineering Problems" at the Nov. 13 meeting of the Schenectady Section, A.S.M.E.

Dr. Addams S. McAllister, recently in charge of specification work, U. S. Bureau of Standards, Washington, D. C., has been appointed assistant director of the Bureau in charge of commercial standardization, to fill the vacancy created by the resignation of R. M. Hudson.

H. F. Moore, professor of engineering materials at the University of Illinois, Urbana, Ill., past-president of the American Society for Testing Materials, spoke on the "Romance of Engineering Materials," on Saturday, Nov. 1, from 7:15 to 7:30 P.M., Eastern Standard Time, under the auspices of the Columbia Broadcasting System, which includes some 32 stations.

Dr. A. Nadai of the Research Laboratories, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., will present a paper entitled "Plastic Torsion," at an Applied Mechanics

session on Monday, Dec. 1, during the A.S.M.E. annual meeting in New York. Distribution of stress in a twisted steel bar is included.

John C. Newman, who has recently been appointed a member of the new Montreal Harbor Commission, is president of the Generai Steel Wares, Ltd., Baldwins, Montreal, Ltd., J. S. Mitchell & Co. Ltd., and the Thomas Davidson Manufacturing Co. Ltd., besides being on the directorate of a number of other firms.

Samuel M. Nicholson, president and general manager of the Nicholson File Co., Providence, R. I., has been elected a director of the Massachusetts Mutual Life Insurance Co., Springfield, Mass. Mr. Nicholson is also president of the American Screw Co., Providence.

Charles W. Pendock, president of the Le Roi Co., Milwaukee, Wis., has been elected a director of the Independent Pneumatic Tool Co., Chicago, Ill., to succeed the late William A. Libkeman, who was a director for many years.

Prof. O. W. Boston of the University of Michigan will present a paper entitled "Machining Properties of

Some Cold-Drawn Steels," at a general session on Wednesday, Dec. 3, during the A.S.M.E. annual meeting.

A. T. Perrin, formerly in the mechanical department of the Dominion Bridge Co. Ltd., Lachine, Que., Canada, has been appointed chief engineer of the Whiting Corporation (Canada) Ltd., Toronto.

Oren H. Persons, formerly assistant manager of sales, Philadelphia, for the American Steel & Wire Co., Chicago, has resigned to become general manager, Edgcomb Steel Co., Philadelphia.

Frederick Schuettel of New York City will discuss "Some Aspects of The Flying Boat" at a meeting of the Metropolitan Section, A.S.M.E. in the Engineering Societies Bldg., on Nov. 18 at 3:30 p.m. A. A. Gassner, chief engineer of the Fokker Aircraft Co., will lead the discussion. Messrs. Boulton and Zivi of the Keystone Airplane Co., will also present a talk on "Monocoque Fuselage Construction."

George Sparks, formerly manager of the Youngstown (Ohio) Steel Co., has become general manager for the Hankel-Clauss Co., Tremont, Ohio.

OBITUARIES

Addison H. Beale, president of the A. M. Byers Co., Pittsburgh, Pa., died suddenly in Chicago on Oct. 28.

Capt. W. H. Christian, 89, designer of many of the river gun-boats used in the Civil War and later designer of the snag-boat operated on the Ohio River by the U. S. Government, died on Oct. 28 at his home in Cincinnati, Ohio.

William W. Collins, 78, died on Oct. 22 at the home of his son-in-law in Jamaica, N. Y.

Charles J. Goehringer, 55, president of the Goehringer Metal Supply Co., Cincinnati, died suddenly on Oct. 26.

La Verne J. Hathaway, 53, foreman of the mechanical department of the Los Angeles Railway Co. for 32 years, died in Los Angeles on Oct. 18.

Thomas H. McKinney, 68, president and part owner of the McKinney Steel & Sales Co., North Chicago, Ill., died on Oct. 23 after a year's illness.

Thomas E. Pennock, 44, president and general manager of the Standard Automatic Machine Co., Rochester, N. Y., died on Oct. 20 at his home in that city.

Edward T. Roberts, 73, member of the engineering firm of Roberts & Abbott, Cleveland, died recently in that city. He was president of the Cleveland Engineering Society from 1911 to 1913.

Walter C. Stoneham, 68, treasurer of the Federated Tool & Machine Co., and the Stoneham Engineering Co., both of Dayton, Ohio, died on Oct. 21 at his home in Dayton.

James A. Whitcomb, 51, president and manager of the Whitcomb Wheel Co., Kenosha, Wis., died suddenly of heart disease at Beatrice, Neb., while motoring.

Arthur C. Woods, who incorporated A. C. Woods & Co., Rockford, Ill., with R. N. Woods and Lotta Woods, died unexpectedly in that city on Oct. 11.

FORTHCOMING MEETINGS

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Calvin W. Rice, executive secretary, Engineering Societies Bldg., 29 West 39th St., New York, N. Y. The following meetings are scheduled:

Fifty-first annual meeting, Engineering Societies Bldg., Dec. 1-5.

Semi-Annual meeting, Birmingham, Ala., Apr. 20-23, 1931.

National Materials Handling Meeting and Management congress, Cleveland, Ohio, Apr., 1931.

National Aeronautic Meeting, Baltimore, Md., May, 1931.

INTERNATIONAL ACETYLENE ASSOCIATION—34th annual convention, Congress Hotel, Chicago, Nov. 12-14. A. C. Morrison, 30 East 42nd St., New York.

NINTH NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING—In Grand Central Palace, New York City, Dec. 1-6. Charles F. Roth, manager, Grand Central Palace.

WESTERN METAL CONGRESS AND EXPOSITION—Second National, Civic Auditorium, San Francisco, Calif., Feb. 16-20, 1931. Under auspices of A.S.S.T. W. H. Eisenman, secretary, 7016 Euclid Ave., Cleveland, Ohio.

THE INDUSTRIAL REVIEW

Weekly progress of the machinery and machine-tool business

NEW YORK

Little change has occurred during the past week, according to dealers. Slight increases occurring in one or two cases are not considered indications of a permanent pick-up, but rather the closing of orders which have been hanging fire a long period. Present orders are usually for replacement and consist principally of single orders for small and light tools. The larger companies, including Westinghouse, General Electric, and New Departure, are displaying no interest in the market whatsoever. Inquiries being received are a little more plentiful than they were last week.

The Pennsylvania Railroad will begin the construction of $5,000,000 worth of new steel cars at its Philadelphia plant within two weeks. The order calls for 1,500 steel cars of the gondola type. Officials of the shipping board have announced that 20,000 men will be put to work and $50,000,000 spent in the construction of merchant vessels during the next twelve months.

DETROIT

Dealers are not looking forward to an early improvement of the market, which has been sagging badly during the last few weeks. In September there was a slight revival after many months of extreme depression. It was believed at that time that October would show a still greater improvement, and the general atmosphere throughout the trade was unusually optimistic. October sales did not come up to expectations and most dealers now report that the average for the month was considerably lower than for September. In a few cases, however, dealers report a greater volume of business in October than in the preceding month. There is nothing of an encouraging nature in the outlook here, and none of the dealers have any information that might indicate that new programs are being planned by industrial concerns. There is some indication that the current month will be slightly better than October, however. The average for the year will probably be about 50 or 55 per cent of last year's volume.

NEW ENGLAND

The machine tool industry appears to move along in uneventful fashion. Objectively it spells progress, but actually gets nowhere. New orders dribble in for single machines, but this collective volume is nothing to write home about. Machine tool builders (those that express an opinion) adhere to the belief orders will be more plentiful following the settlement of political problems and an adjustment of general market conditions—all of which isn't a matter of mere moments.

Industrial gains are still prominent in several sections of New England. Textile manufacturers and the radio tube industry show gains last week. A Connecticut company booked a good order for chucking machines. The General Electric Co., Pittsfield, received a $400,000 order for transformers for shipment to the Southern California Power Co.

CINCINNATI

Comparing business of the past month with that of the previous one, most machine-tool manufacturers of this district find progress at about the same slow pace. A few made a slight gain and about an equal number had a slight loss. The best that can be said of the past week is that there was no falling off in general demand. With the selling agents business is just jogging along, with small orders making up such demand as there is from local and adjacent territory.

■

THE QUIET of the night before Christmas seems to have settled over many a machine-tool business house; there are few mice who dare be so bold as to nip a piece of the most inviting cheese in years, at a time when all the traps have been sprung and the cat's off on a holiday. Here and there, however, are leaders who have realized that if business waits for Wall Street it will wait until spring. These men are buying now—with a good chance of leaving their super-timid contemporaries in full possession of the good old-fashioned gunny sack.

NEW YORK markets are quiet, though here and there are strong indications of faith that the worst of the storm has been weathered. Detroit, jubilant several weeks ago, is again disappointed with a non-car-buying world, though some sales indexes are up. New England dealers place some of the blame on over-zealous and over-vociferous politicians endeavoring to place the blame on their opponents, though textile, radio, and other industries look better, and one company has a good order for chucking machines. Cincinnati is pretty slow for both manufacturers and dealers.

PHILADELPHIA reports some sales of radials, lathes, and woodworking tools, and some improvement in the general tone. Milwaukee orders, increasing week by week, are from a widely diversified field, though many are from the Southwest. Chicago's sales are for single items. Southern District markets are quiet, part of the reason being the present low oil prices.

PHILADELPHIA

There were a few bright spots during the last few weeks. Some sales of lathes and radial drills, together with some activity in woodworking machinery, was noted, while some report a slight improvement in the general tone, based upon inquiries received during the last fortnight. One man who has made a careful survey of the situation says that one plant out of four or five shows a slight betterment in activity during the last month or so. Expectations of sales in sizeable volume, however, is slight, so far as the immediate future is concerned. The market here seems to be prepared for a wait of some months before looking for a marked improvement. Meanwhile, a campaign for the public to "buy now," fostered by the Chamber of Commerce, has improved the local tone.

MILWAUKEE

While business took a more favorable trend during the latter part of October, and the month showed an improvement over September, sales at this time are still far below last year. Several distributors of standard lines of machinery and tools report sales as 10 per cent higher in September, and a business gain in October of from 15 to 18 per cent over September.

Manufacturers here state that actual orders are slow but are showing a slight improvement. Inquiries and prospects both are improving. The southwestern oil districts are considered by some as the best prospects, judging from inquiries received, while the Cleveland district is also placing more orders. The Detroit automotive trade is a factor only spasmodically. Much of the actual business now is coming from the same firms previously in the market. Orders are coming from a well-diversified field, including light manufacturing jobbing shops, equipment manufacturers, and steel manufacturers. Railroad business is fair, with automotive slower and agricultural industries absent from the market.

Numerous inquiries received and some actual orders placed are considered indicative of an upward business trade by some officials of local concerns. Others expect no real upturn until spring.

CHICAGO

Little or no change has been noted in the machine-tool market during the last week. Reports from manufacturers' representatives and selling agents telling of unimportant sales, practically all of single tools, continue with small variation. One exception of a conspicuous character is noted, however, and indicates that there are occasional outstanding instances of unusual production activities. The representative of a large tool building plant today informed the writer that the sales of his company for the months of September and October this year, from a monetary computation, were double those of the same months last year. He said, further, that his company's engineering staff was working far into the night to produce plans and specifications for special machines ordered, and that within the last month orders for four such units, averaging in price about $10,000 each, had been booked. He ended his statement by saying that inquiries for approximately $100,000 worth of machine-tools made by his company were awaiting prospective closing. Rumors that builders of farm machinery and tractors have started budget-making on needed equipment for next year are current.

SOUTHERN DISTRICT

Sales of machinery and machine tools in this district continued quiet the past fortnight. No orders to speak of developed to incite wide competition. A single fair-sized transaction was uncovered in Florida, involving approximately $8,000, but little other business was reported. Small tools and equipment comprise the bulk of orders, and this business is so well distributed geographically as not to form a definite trend of the buying, either as to sections or industries.

The railroads have made relatively little inquiry, and then only in extreme cases. Oil fields and points centering around the Houston and New Orleans districts continue quiet. Oil prices are largely responsible for this condition. Birmingham shows no evidence of immediate recovery from its extended dullness, but in this it probably will be companioned by the remainder of the district. Hope is held out for some improvement as the winter months draw on, but there is really no sound basis for an improved condition.

BUSINESS • BAROMETER

Feeling in the commercial and industrial world is decidedly more cheerful than it was

THEODORE H. PRICE
Editor, Commerce and Finance, New York

IN THE United States the art of publicity has been so perfected that its practitioners have sometimes overreached themselves. This may have happened in the case of the campaign orators who have been trying to prove that one political party or another is responsible for the depression in business. In their vehemence they have greatly exaggerated the alleged depression, and even now there are signs of its passing.

The most significant evidence of confidence and hope is to be found in the commodity markets, where the staples traded in, are in many cases substantially higher than they were. This is particularly true of sugar, which is up nearly 50 per cent from the recent bottom, and cotton, which advanced last week $7.50 a bale above the season's low. An improvement that is less sensational is shown by many other commodities, and the feeling grows that the bottom has been reached and passed in the case of most essentials. It is, however, possible that coffee may be an exception to this generalization. Copper is another article which appears to be in over-supply, but at 9½ cents many consumers are anticipating their requirements, and an organized effort to control the world output and the price is said to be under consideration by the copper magnates that have recently been in conference in New York.

Taken as a whole, the feeling in the commercial and industrial world is distinctly more cheerful than it was, and those who ought to know feel confident of the future. Car loadings for the week ended October 18 are 25 per cent below last year's phenomenal figures, but railroad net earnings thus far reported for September show a decrease of only 21.2 per cent, as compared with the same month a year ago. This is regarded as distinctly encouraging by those who feared that the railroads would be unable to reduce their expenses, and better results are expected in October.

The depression in the automobile industry is expected to pass with the year 1930. It has been very acute, but the decline in production during recent weeks has been somewhat less than the usual seasonal falling off, and the lower the industry dips this fall the sharper will be its recovery in 1931. The same is true of steel; the latest reports are a little disappointing, but it is obvious that the present rate of production is much below the country's actual needs and there is ample reason for believing that operations are about at bottom for the year except for the Christmas shutdown. There is a natural tendency to go slow until the election is over, but no trepidation is felt over the outcome, which is not expected to have much effect.

THE BUSINESS WEEK

November 5, 1930

AS WE near the end of October, when activity is usually at its Fall peak, it becomes clearer that business this year has failed to respond in full measure even to the usual seasonal expectations. . . . This is more clearly evident in primary production and distribution than in general trade, which still appears to be moving on and up to its holiday high point. . . Our preliminary index for the week ended October 25 fell further, from 84.3% to 83.2% of normal, a new low level in the current recession, reflecting relative slackening in steel, coal, and electric power production, merchandise carloadings, and building contracting. . . The sustained strength of residential building, especially in the New York metropolitan area, relative improvement in railroad earnings, steady reduction of stocks of staple cotton and wool textiles and lumber, continued stability of commodity prices, are moderately bullish portents of recuperation. . . . There is a bare possibility that November and December will make a better than seasonal showing or at least more favorable comparisons with last year than heretofore. . . But it is clear that business is again disposed, as in July and August, to throw away another two months of this year and to wait for the buds and birdies of Spring, which the sublime laws of nature invariably supply on schedule. . . With production cut to 50% of capacity for two months more, and consumption running on, as it is, not far below normal, human nature may yet give those resigned Brahmins of business a swift and surprising kick in the pants after the turn of the year.

©The Business Week

The conditions in Europe, South America, and the Orient reflect a continuance of the political turbulence that is now most active in Brazil. The latest advices from South America encourage the hope that there will be little bloodshed as a result of the upheavals that have taken place. News is, however, carefully censored, and it is difficult to obtain the facts. In any event they should not have an adverse effect upon this country's business with its Latin-American neighbors. It is at least encouraging to read that President Machado has Cuba in hand.

The outlook in China and in India appears to be less serious than it was two or three weeks ago. Reliable information in regard to existing conditions is, however, hard to obtain, and the English and American merchants who do business with the Far East must continue to use dead reckoning in charting the course that they decide to follow. The most significant news that comes from Europe relates to the London Conference at which the proposal to build a tariff wall around the British Empire has been tactfully defeated. As a result Great Britain will have to fight it out along the lines that she has been following since the Armistice.

But Great Britain's commercial policy will not have much effect upon the near future of American business. The facts are that President Hoover and a host of less influential political functionaries are advising that the Federal Government, as well as the cities and the states, should put the idle to work in completing the various public improvements that have been planned or authorized. Of course this program involves the sale of state and municipal bonds on a large scale, and it pleases the politicians because it will enable them to provide jobs for their constituents during the coming winter.

Carried to its logical conclusion this policy means more or less inflation, and it is quite possible that we are now discounting and will continue to discount, the revival in trade that these expenditures may cause. From some points of view this is desirable; from others it is objectionable. But there are few who will quarrel with the improvement in business that will probably result and which seems to be in sight.

Copyrighted
Theodore H. Price Publishing Corporation
95 Broad St., New York

THE WEEKLY PRICE GUIDE . . . .

Rise and Fall of the Market

RAILROADS are taking the bulk of the steel now being sold. While steel demand continues to sag, prices hold to quoted levels with few concessions obtainable. Certain of the non-ferrous metals displayed firmer prices during the week. Tin, zinc, solder and babbitt metal are higher, while declines occurred in copper, antimony and fabricated brass and copper. In the case of zinc, sales were so slow that the published quotation amounts to nothing more than an asking price. Despite depressed domestic selling, the copper export trade appears to be gaining.

(All prices as of Oct. 31, 1930)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern (silicon 1.75@2.25)	$16.69@$18.19
Northern Basic	19.89@ 20.39
Southern Ohio No. 2	19.89@ 20.39
NEW YORK—Tidewater Delivery	
No. 2 Southern (silicon 1.75@2.25)	18.00@ 18.50
BIRMINGHAM	
No. 2 Foundry (silicon 1.75@2.25)	14.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	20.00
Virginia No. 2	18.75@ 19.25
Basic	22.29
CHICAGO	
No. 2 Foundry, local (silicon 1.75@2.25)	19.00
No. 2 Foundry, Southern (silicon 1.75@2.25)	18.20
PITTSBURGH, including freight charge ($1.76) from Valley:	
No. 2 Foundry	19.63@ 20.13
Basic	19.63@ 20.13
Bessemer	20.76

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.00
Cleveland	4.75
Cincinnati	4.45
New York	4 75@5.00
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots:

Blue Annealed*	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	1.90@2.00	3.35†	3.00	3.40†
No. 12	1.95@2.05	3.45†	3.10	3.45†
No. 14	2.05@2.15	3.55†	3.20	3.50†
No. 16	2.15@2.25	3.65†	3.30	3.60†
Black				
Nos. 18 to 20	2.25	3.60†	3.40	3.70
No. 22	2.40	3.75†	3.55	3.85
No. 24	2.45	3.80†	3.60	3.90
No. 26	2.55	3.90†	3.70	4.00
No. 28	2.70	4.05†	3.85	4.15
Galvanized				
No. 10	2.30@2.40	3.65†	3.65	3.55
Nos. 12 to 14	2.40@2.50	3.75†	3.75	3.65
No. 16	2.50@2.60	3.85†	3.85	3.75
No. 18	2.65@2.75	4.00†	4.00	3.90
No. 20	2.80@2.90	4.15†	4.15	4.05
No. 22	2.85@2.95	4.20†	4.20	4.10
No. 24	3.00@3.10	4.35†	4.35	4.25
No. 26	3.25@3.35	4.60†	4.60	4.50
No. 28	3.50@3.60	4.85†	4.85	4.75

*Light Plates. †400 to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. butt..	56.14%	43.6%	53.3%	42.3%	57.3%	44.8%
3½ to 6 in. lap..	52.72%	40.18%	50.8%	37.8%	53.9%	41.4%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches—External	Diameter in Inches—Internal	Thickness Inches
⅛	$0.17	1.315	1.049	.133
¼	.23	1.66	1.38	.14
⅜	.27½	1.9	1.61	.145
½	.37	2.375	2.067	.154
⅝	.58½	2.875	2.469	.203
¾	.76½	3.5	3.068	.216
⅞	.92	4.0	3.548	.226
1	1.09	4.5	4.026	.237
1¼	1.48	5.563	5.047	.258
1½	1.92	6.625	6.065	.28
2	2.50	8.625	8.071	.277

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

Thickness—Decimal	B.w.g. and Fractions	Outside Diameter in Inches—⅛	¼	⅜	½	⅝	¾	1	1¼	1½
		Price per Foot—								
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23		
.049"	18	.17	.18	.19	.20	.21	.23	.25		
.065"	16	.19	.20	.21	.22	.23	.25	.27		
.083"	14	.20	.22	.23	.24	.25	.27	.29		
.095"	13	.21	.23	.25	.26	.27	.29	.31		
.109"	12	.22	.24	.26	.27	.28	.30	.32		
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33		
.134"	10	.24	.26	.28	.29	.30	.32	.34		

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	7.00	6.00	6.15
Hoop steel	3.75†	4.00	3.75†
Cold rolled strip steel	4.95	6.00	6.10
Floor plates	4.85†	5.30	5.00†
Cold fin., round or hexagon‡	3.40	3.65	3.35
Cold fin,, flat or square‡	3.90	4.15	3.85
Structural shapes	3.10†	3.00	3.00†
Soft steel bars	3.10†	3.00	3.00†
Soft steel bar shapes	3.10†	3.00	3.00†
Soft steel bands	3.40†	3.65	3.20†
Tank plates	3.10†	3.00	3.00†
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, 3/16-in. thick by ¾-in. wide. †400 to 3,999 lb., ordered and released for shipment at one time. ‡Cold finished steel, shafting and screw stock.

Electric welding wire at New York warehouse—3/32, 8.35c. per lb.; ⅛, 7.85c. per lb.; 5/32 to ½, 7.35c. per lb.

METALS

Warehouse Delivery Prices in Cents Per Lb. for Small Lots:

Copper, electrolytic, New York			11.00
Tin, Straits, pigs, New York			29.00@30.00
Lead, pigs, E. St. Louis	4.95	New York	6.00@ 7.00
Zinc, slabs, E. St. Louis	4.00	New York	6.00@ 7.00

	New York	Cleveland	Chicago
Antimony, slabs	10.00@10.50	10.50	10.75
Copper sheets*	19.25	19.25	19.35
Copper wire*	11.25	13.12½	11.87½
Copper, drawn, round*	17.75	17.75	18.25
Copper tubing*	21.62½	21.62½	22.00
Brass sheets, high*	16.62½	16.62½	17.00
Brass tubing, high*	21.50	21.50	21.87½
Brass rods, high*	14.87½	14.87½	15.25
Brass wire, high*	17.12½	17.12½	17.50

*Mill, base.

SHOP MATERIALS AND SUPPLIES

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%†	24.00@25.00	24.30	23.30
Zinc sheets (casks)	9.75@10.25	11.25	10.11
Solder (½ and ½)	22.75	21.50	20@22
Babbitt metal, delivered in case lots, New York, cents per lb.:			
Genuine, highest grade			47.00
Commercial genuine, intermediate grade			34.00
Anti-friction metal, general service			30.00
No. 4 babbitt, f.o.b.			10.00

†F.O.B.

NICKEL AND MONEL METAL—Price in cents per lb., base, f.o.b. Huntington, W. Va.:

	Nickel	Monel Metal
Sheets, full finished	52.00	42.00
Sheets, cold rolled	60.00	50.00
Strip, cold rolled	55.00	45.00
Rods, hot rolled	45.00	35.00
Rods, cold drawn	50.00	40.00
Tubing	75.00*	90.00†
Angles, hot rolled	50.00	40.00
Plates	52.00	42.00

*Seamless. †Welded.

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars:

	New York	Cleveland	Chicago
Crucible copper	8.00 @8.25	7.25	7.25@ 7.75
Copper, heavy, and wire	7.50 @7.75	7.00	6.75@ 7.25
Copper, light, and bottoms	6.75 @7.00	6.50	6.00@ 6.50
Heavy lead	4.00	4.00	3.00@ 3.50
Tea lead	2.00	2.50	2.00@ 2.50
Brass, heavy, yellow	4.50 @4.75	5.00	4.00@ 4.50
Brass, heavy, red	7.00 @7.50	8.25	6.25@ 6.75
Brass, light	3.50 @3.75	4.00	3.50@ 4.00
No. 1 rod-brass turnings	4.75 @5.00	4.00	4.00@ 4.50
Zinc	2.00	1.50	1.25@ 1.50

TIN PLATES—Charcoal—Bright—Per box:

"AAA" Grade:	New York	Cleveland	Chicago
IC, 14x20	$12.10	$11.95	$11.50
"A" Grade:			
IC, 14x20	9.70	9.90	9.50
Coke Plates—Primes—Per box:			
100-lb., 14x20	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box:			
IC, 14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.13	$0.16	$0.15
Cotton waste, colored, per lb.	.09½	.12	.10
Wiping cloths, washed, white, per lb.	.14	38.00 per M	.14½
Sal soda, per lb.	.01½	.02	.02
Roll sulphur, per lb.	.028	.03	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb.	.104	.125	.108
Cutting oil, about 25% lard, in 5 gal. cans, per gal.	.65	.60	.60
Machine oil, medium-bodied (55 gal. steel bbl.) per gal.	.33	.36	.24
Belting—Present discounts from list in fair quantities (½ doz. rolls) for leather or rubber:			
Leather—List price, 24c. per lin.ft., per inch of width, for single ply:			
Medium grade	30–10%	30–10%	35%
Med. grade, heavy wgt.	30%	30 –5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft.:			
First grade	60%	50–10%	50%
Second grade	60–5%	60– 5%	50–10%

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.031	$0.031	$0.0325
Cold fin. shafting	per lb.	.034	.034	.036
Brass rods	per lb.	.1487½	.1562½	.2125
Solder (½ and ½)	per lb.	.2275	.2425	.3075
Cotton waste, white	per lb.	.13	.13	.13
Disks, aluminum oxide mineral, cloth, No. 1 6-in. dia.	per 100	4.59	4.59	4.60
Lard cutting oil	per gal.	.65	.65	.65
Machine oil	per gal.	.33	.33	.33
Belting, leather, medium	off list	30–10%	30–10%	30–10%
Machine bolts, up to 1x30 in., full kegs	off list	65%*	65%*	50–10%*

*List prices as of April 1, 1927

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials — Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper*	$6.03	$6.03	$6.03
Emery cloth*	25.87	25.87	25.87
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper†	2.61	2.61	2.61
Cloth†	4.59	4.59	4.59
Fire clay, per 100 lb. bag	1.00	.75	.75
Coke, prompt furnace, per net ton	Connellsville,		2.60
Coke, prompt foundry, per net ton	Connellsville,		3.50@4.85
White lead, dry	100 lb. kegs	New York,	13.75
White lead, in oil	100 lb. kegs	New York,	13.75
Red lead, dry	100 lb. kegs	New York,	13.75
Red lead, in oil	100 lb. kegs	New York,	15.25

*Less than 3 reams. †Less than 200.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

Machine bolts:	
Up to ¾-in. x 6-in., full kegs, list less	65%
Larger, up to 1 x 30-in., full kegs, list less	65%
Less than full kegs or case lots, add to list	10%
Fitting-up bolts: list less	45%
Lag screws:	
Up to ½-in. x 6-in., list less	65%
Larger, list less	65%
Less than full keg or case lots, add to list	10%
Rivets:	
Structural, round head, full kegs, net	$4.50
Structural, round head, broken kegs, net	6.00
Tank, 7/16-in. dia. and smaller, list less	65%
Nuts:	
Hot pressed, square or hexagonal, blank or tapped:	
Full kegs up to 1-in., incl., list less	65%
Larger, up to 3-in., list less	65%
Less than keg or case lots, add to list	10%
Washers:	
Wrought, full kegs, per 100 lb., list less	$4.00
Wrought, broken kegs, per 100 lb., list less	2.00
Turnbuckles:	
With stub ends, list less	20–10%
Without stub ends, list less	55%
Chain:	
Proof coil, base, per 100 lb., net	$8.50
Cast iron welding flux, per lb., net	.35
Bronzing flux, per lb., net	.50

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Equipment Wanted

Conn., New Canaan—Bd. of Education—manual training equipment for proposed junior high school. Estimated cost $275,000.

Mass., Boston—Mack Battery Co., 664 Harrison Ave.—d.c. electric drill, ¼ or ⅜ in.

N. C., Leaksville—Leaksville School District, —manual training equipment for proposed 2 story high and grade school. Estimated cost $110,000.

Opportunities for Future Business

Calif., Los Angeles—Rheem Mfg. Co., 4535 Horton St., Emeryville, awarded contract for a 1 story, 210 x 400 ft. factory at Firestone Blvd. and Rheem Ame. here. Estimated cost $100,000. Noted Oct. 30.

Calif., San Francisco—Maggini Co., 123 Jackson St., postponed construction 1 story automobile sales and service plant at Broadway and Battery St. L. H. Nishkian, 525 Market St., Archt. Maturity indefinite.

Calif., San Francisco—Seattle Chain & Mfg. Co., 6921 East Marginal Way, Seattle, Wash., awarded contract for the construction of a manufacturing plant here. Estimated cost $50,000.

Conn., Hartford—New England Electric Co., 103 Allyn St., is having plans prepared for a 3 story, 70 x 90 ft. service building at Spring and Church St. Ext. Estimated cost $75,000. Wescott & Mapes, 139 Orange St., New Haven, Archts.

Conn., New Britain—Vulcan Iron Works, 63 John St., is having revised plans prepared for a 1 story, 70 x 175 ft. factory. Estimated cost $50,000. M. J. Unkelbach, 52 West Main St., Archt. Former bids rejected. Noted Oct. 9.

Conn., New Haven—Todd Rubber Co., 125 Whalley Ave., is receiving bids for the construction of a 1 story garage and service station. Estimated cost $50,000. W. R. Shiner, 185 Church St., Archt.

Conn., South Norwalk—Segal Lock & Hardware Co., 12-14 Warren St., New York, N. Y., plans to increase the capacity of plant of its subsidiary, Universal Safety Razor, for manufacture of a new single unit safety razor.

Ga., Atlanta — Commonwealth Marble & Granite Co., National Marble & Granite Co. and associated companies, plan to rebuild mills recently destroyed by fire. Loss $125,000 including equipment.

Ill., Chicago—Chicago & Northwestern Ry. Co., 400 West Madison St., plans to expend $500,000 in November and December for heavy repairs to equipment not in service. E. A. Clifford, Gen. Purch. Agt.

Ill., Chicago—Star Nipple Co., North Chicago, awarded contract for the construction of a 1 story, 132 x 142 ft. factory on South Richmond St. Estimated cost $50,000.

Ill., Lincoln — The Lincoln Casket Co., W. Dowling, Pres., plans the construction of a 2 or 3 story addition to factory. Estimated cost $75,000. Private plans.

Ill., Peoria—Keystone Steel & Wire Co., C. W. LaPorte, Asst. to Pres., South Bartonville, will build a 1 story, 300 x 400 ft. warehouse. Estimated cost $100,000. H. C. Hewell, c/o Owner, Engr. Work will be done by day labor.

Kan., Wichita—City will soon receive new bids for the construction of a repair shop. E. Charles & Co., Archts. Former bids rejected.

Mass., Arlington—Stuart-Marshall Realty Co., 825 Beacon St., Newton, is having plans prepared for addition to service garage at Broadway and Alton St., here. Estimated cost $40,000. C. J. S. White, 825 Beacon St., Newton, Archt. C. B. Perham, Inc., 925 Broadway, Arlington, lessee.

Mass., Springfield — Dept. of Streets, City Hall, awarded contract for the construction of a 2 story service and shop building. Estimated cost $125,000. Noted Aug. 21.

Minn., Minneapolis—Minneapolis Gas Light Co., 800 Hennepin Ave., will soon receive bids for a 4 story repair and service building and storage plant. Estimated cost $150,000 including equipment. Ekman, Holm & Co., Phoenix Bldg., Archts.

N. J., Montclair—Public Service Products Co., 80 Park Pl., Newark, postponed construction of a 1 story, garage, repair shop boiler house, etc., at 101 Greenwood Ave. here. $150,000. Project in abeyance. Noted Sept. 4.

N. J., Newark—Eastern Airport Transport, Inc., Newark Airport, leased site here and plans the construction of hangars, repair shop, etc. Estimated cost including equipment $75,000.

N. J., Newark—R. C. Jenkinson & Co., Inc., recently organized plans to take over and expand plant of company of same name, manufacturers of sheet metal and wire goods, at 293 Washington St.

N. Y., Albany—Albany Cooperage Co., 100 Arch St., will soon receive bids for the construction of a 2 story, 85 x 110 ft. warehouse on Duncan Ave.

N. Y., Long Island City—Voorhees Gmelin & Walker, 101 Park Ave., New York, will receive bids until No. 17 for the construction of a warehouse and shop at Dutch Kills Basin and 47th Ave. for the Crane Co., 836 South Michigan Ave., Chicago, Ill. Estimated cost $430,000. Noted Oct. 30.

N. Y., Naponoch—Dept. of Correction, State Capitol, Albany, will receive bids in Nov. for the construction of an industrial shop, etc., for State Institution of Defective Delinquents here. Noted Oct. 9.

N. Y., New York — A. J. C. Corp., A. J. Chesley, Pres., 704 East 133rd St., is receiving bids for a 2 story, 90 x 245 ft. garage and automobile laundry at Barry St. and Burnett Pl. Estimtaed cost $250,000. P. J. Murray, 14 West 45th St., Archt. Noted Oct. 23.

N. Y., New York—Consolidated Gas Co., 4 Irving Pl., awarded contract for a 1 story, 62 x 201 ft. service garage at 415 East 110th St. Estimated cost $75,000. Repair shop and office at 71st St. and Exterior Ave., in abeyance. $350,000.

N. Y., New York—Harrod Holding Corp., S. Kusnetz, Pres., 1101 Manor Ave., will build a 2 story, 110 x 144 ft. service garage at Austin Pl. and Brady Ave. Estimated cost $70,000. J. Bleich, 4756 3rd Ave., Archt. Work will be done by separate contracts. Maturity indefinite.

O., Bowdil—Bowdil Co., plans the construction of a 1 story, 24 x 200 ft. factory for the manufacture of mine machinery and tools. Estimated cost $40,000. Private plans.

O., Canton—United Engineering & Foundry Co., 1400 Grace Ave. N. E., manufacturer of rolling mill machinery and heavy castings, plans the construction of a factory and installation of equipment. Estimated total cost $400,000. Private plans.

O., Cincinnati—H. J. Berning, 1124 West 8th St., plans the construction of a 3 story garage on Central Parkway. Estimated cost $150,000. J. J. Brown, Provident Bank, Archt.

O., Cleveland—Cleveland Lithograph Co., C. Morgan, Pres., East 17th St. and Payne Ave., awarded contract for a 1 story, 55 x 100 ft. factory at 1546 East 23rd St. Estimated cost $40,000.

O., Cleveland — Powerlite Switchboard Co., J. F. Kirka, Secy. and Treas., 4149 East 71th St., awarded contract for a 1 and 2 story, 50 x 122 ft. factory and office at 4149 East 71st St. Estimated cost $50,000. Noted Oct. 23.

O., Cleveland—Roberts Realty Co., M. Siegel, 1942 Woodward Ave., awarded contract for the construction of a 1 story, 47 x 108 ft. light reflector plant at 3856 Woodland Ave. Estimated cost $40,000.

O., Fostoria—Fostoria Screw Co., has work under way on a new 80 x 150 ft. addition to plant, also improving present plant.

Pa., St. Marys—Spear Carbon Co., D. Miller, Gen. Mgr., awarded contract for the construction of a 1 story, 82 x 119 ft. carbon electrode plant. Estimated cost $40,000. C. Lyons, Engr.

Pa., Sayre—Lehigh Valley R.R. Co., 143 Liberty St., New York, N. Y., Sayre shops to go on a four-day basis beginning Nov 3. Shops have been on a three-day basis for the past four months.

Pa., Philadelphia—Philadelphia Gas Works Co., Broad and Arch Sts., will soon award contract for the construction of a 1 story, 48 x 158 ft. machine and plate shops at Caster Rd. and Balfour St. Private plans.

R. I., Providence—E. G. Page, 225 Fountain St., is receiving bids for the construction of a 2 story, 75 x 155 ft. service station. Estimated cost $75,000. F. Chiaverini, 32 Broadway, Archt.

Tenn., Jackson—Smith Motor Coach Co., F. Smith, Pres., 144 North Front St., had plans prepared for the construction of a 1 story maintenance garage near Square St., $50,000, also remodeling passenger terminals here, $10,000. Jones & Furbringer, Porter Bldg., Memphis, Archts.

Tenn., Memphis—Shelby County Institutions Commission, will receive bids until Nov. 10, for the construction of a machine shop and garage at Shelby County Panel Farm, Mullins Station.

Va., Goshen—Imperial Fossil Marble Corp., recently organized, and plans to establish a marble-working plant in Panther Gap, near here. Conveying equipment, air compressors, etc., will be installed. First unit for cutting, grinding, finishing, etc., to cost $85,000.

W. Va., Berkeley Springs—Berkeley Springs Industries, Inc., recently organized, plans the construction of a 1 story, 150 x 195 ft. plant for the manufacture and bottling of beverages, to include facilities for the manufacture of dispensing equipment. Estimated cost including equipment $90,000.

Wis., Waukesha—Spring City Foundry Co., manufacturer of gray iron castings, awarded contract for the construction of a 1 story, 40 x 70 ft. and 3 story, 30 x 80 ft. cupola building. Estimated cost $65,000 including equipment.

Man., Winnipeg—Leyland Motor Truck Ltd., Leyland, Great Britain, plans the construction of assembling plant for trucks, buses, etc. here. Estimated cost $200,000.

Quebec—American Brake Shoe & Foundry Co., 230 Park Ave., New York, N. Y., plans the construction of a new foundry here. Estimated cost to exceed $50,000, including equipment.

France — Trefileries & Laminoirs, Harve, France, plans the construction of an electrolytic copper refinery, 30,000 ton annual capacity. Location not disclosed.